

AVIATION WEEK

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DEC. 7, 1953

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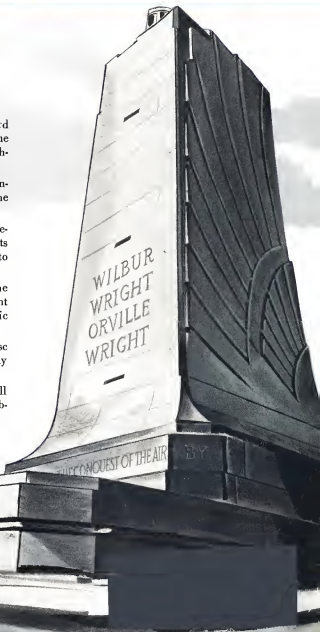
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WHO'S WHERE

In the Front Office

John E. Alcock, executive assistant secretary of Commerce for Aeronautics and member of NACA (1945-48), a new all executive vice president of Northrup Aircraft, Hawthorne, Calif.

William A. Ullrich and **William C. Moore**, both formerly with Boeing Aircraft Corp.'s Seattle Aircraft Division, have organized Allied Transcon Services Sales and Engineering Corp. at Glenside, Pa., as president and vice president.

A. W. Maguire, former executive of General Motors Aircraft Corp. and Hughes Aircraft Co., has been appointed associate vice president and general manager of Fairchild Corp., Los Angeles.

Clarence Frank, chairman of General Foods Corp., has been elected to the board of Boeing Aircraft Corp., Detroit. Long experience has become chief manager of Polysar-Polymer Division, subsidiary of Tyco, N. J., and **Willard Stewart** a new production manager.

Carl Webb Wilson, special assistant to the president of United States Freight Co., and **Hal A. Koenig**, New York management consultant, have been elected directors of Air Associates, Inc., Teaneck, N. J.

Changes

C. H. Shep has been promoted to general manager of R. H. Rogers, Toledo, Ohio. Other changes in the electronics firm: **C. R. Thayer**, chief engineer, R. J. Markham, special projects engineer.

Erik Howard has been appointed vice president of the aircraft branch of the engine test facility at Aerodyne Engineering Development Center, Tullahoma, Tenn.

Richard Baile is now assistant to the vice president—public relations of Northwest Orient Airlines.

Carl F. Brown, formerly with Lockheed Aircraft Corp. and Glenside, L. Mullis Co., has become manager of Federal Mogul Corp.'s Greenville, Mich. Division.

Leslie E. Toftness has been appointed manager of industrial products for Smith Co., San Francisco electronics products.

Larry Olmick is manager of National Airlines' new public relations branch and travel bureau in New York.

Corbin E. Rice has been named general contract manager for Borg Warner Corp.'s Niagara Aircraft Division.

Elliot R. Kramer has been promoted to senior marketing manager for Western Air Lines.

Honors and Elections

Earl I. Skidmore, engineering manager of United Aircraft Corp.'s Sikorsky Aircraft Division, has been elected the University of Detroit alumni of aeronautics. "SIC" award is "honorary outstanding man of the year."

Joseph de Rott Schick, Portugal representative on the council of International Civil Aeronautics Organization, a new chairman of the ICANO Committee on Joint Support of Air Navigation Services.

INDUSTRY OBSERVER

▶ Boeing has installed a new version of the Pratt & Whitney [T7] turbo-propeller outboard in its B-52 Stratofortress with a thrust of more than 10,000 lb. Convair [T7] models in the experimental B-52 delivered 5,700 lb thrust. Production models of the B-52A are scheduled to get the higher thrust engines.

▶ Although USAF still is supporting development of the Convair XH-55 supersonic bomber as eventual successor to the B-45, Boeing is developing a competitor for the Convair project in its Wichita plant. The Boeing project is expected to emerge as a supersonic version of the B-47 Stratojet.

▶ National Advisory Committee for Aeronautics expects to grapple soon with this data on the performance of its study straight wings with modified double wedge airfoils as the transonic stage has its projected flight test program with the Douglas X-5 research aircraft.

▶ American Airlines will attempt to set a new official transcontinental speed record in the transport category with its Douglas DC-7 only next year when winter winds blowing from west to east are at maximum strength. Present record is 6 hr. 17 min. set in 1949 by a Lockheed Constellation on an Eastern Air Lines delivery flight from Burbank to Los Angeles Field. Record 6 hr. 11 min. setting of a fully loaded American DC-7 was made only the longer route between Los Angeles International and New York's Idlewild. It bettered the previous unofficial record for passenger-laden transport of 5 hr. 47 min. made in 1947 by a United Air Lines DC-6.

▶ Douglas DC-7s are equipped with a Mach meter as part of their winged instrument. Normally the DC-7 cruises at Mach 1.8.

▶ American Airlines engineers are looking for a ducted-fan turbojet with a higher percentage of bypass air than utilized in the current design of the Rolls-Royce Conway [1,500-hp-thrust bypass jet. Allison Division of General Motors experimented heavily with ducted fans several years ago but there is currently no concrete activity in this field by U.S. engine builders.

▶ The American World Airways, Aerolineas Argentinas and Comodoro Andean are investigating purchase of Douglas DC-7 transport. Currency exchange problems is the only obstacle for Argentine purchase of the DC-7.

▶ Pratt & Whitney Aircraft's [T7] turbojet is being considered as a powerplant for some long-range bombers.

▶ Douglas A2D Skyhawk made an emergency landing at Edwards AFB recently when its turbo-propeller gearbox disintegrated, throwing the counter-rotating prop blades clear.

▶ Pan American World Airways has no Air Force contract to develop experimental rocket and turbojet delivery systems with experimental aircraft used was done in Germany before World War II. Pan American and Radio Corp. of America are still negotiating with USAF over contract operation of the long-range missile program ground at Goons, Fla.

▶ Arg. Inc. has begun testing the Hughes Aircraft F400 as a test engine installed in one of the gas turbine engines at the Arnold Engineering Development Center. Collaborative experiments on the engine test facility are scheduled for early next year with first actual engine tests booked for next March.

▶ North American P84B all-weather interceptor is the latest USAF plane to use vortex generators. These devices are employed around the fuselage air inlets and on the wings to avoid turbulent airflow. Boeing B-47 also uses vortex generators on its wings.

▶ Republic's F105 will be used generally as a research aircraft aimed at exploring the speed range up to Mach 3. Data obtained from the F-101 program will be used to develop a tactical aircraft with this speed capability. Materials suitable for withstanding high temperatures generated over Mach 3 will be a major problem in the F-101 research program.

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AVIATION WEEK

Equipment Makers Win Buying Fight

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- Major weapons subsystems to be purchased directly by USAF and furnished to prime contractors.
- New policy recaptures for Air Force buying authority delegated under previous single-contractor concept.

By Robert Hulse

Armies and aircraft component manufacturers won a major victory in their battle against the single prime contractor policy of weapons system procurement with publication of a new Air Force Regulation (73R) that re-establishes their traditional business relationship with USAF.

The new regulation recognizes the principle of the single prime contractor policy (AVIATION WEEK Aug. 17, p. 32), but stipulates that the Air Force will not require the exclusive development of the weapons system contractor.

Under the former policy, largely equated by the Air Research and Development Command, USAF dealt with a single prime contractor for the development of a complete weapons system and gave him authority to subcontract development of all major sub-systems (except propulsion) as this overall system. Third and fourth contractors of this type lost to date was with General Dynamics for development of a strategic bombing system (X-35).

• **Direct Contracting**—Under the new regulation, USAF will contract with a single prime contractor to develop a complete weapons system that enjoy subcontracts such as flight control, bombing and navigation, and transport systems will be purchased both directly from the prime contractor and subcontractors. Development and production phases of direct contract between the subcontract manufacturer and the Air Force.

The prime contractor will provide procurement-type services to the Air Force. Other subcontractors who must be approved by ARDC. Equipment purchased in this manner will be furnished to the prime contractor by USAF for inclusion in his complete weapons system.

• **Subcontract Vendors**—The single prime contractor policy of weapons system development has been a target of criticism by congressional manufacturers because it was first proposed by ARDC more than a year ago. This new regulation, however, it would result in creation of significant aircraft prime contractor who would expect to handle develop-

ment and production of all subsystems. They also objected to the prospect of contracting with prime contractors (often those directly with USAF, ARDC) who were developing an independent company in the aircraft industry to become opponents that those laws are provisions, and specifically would not the Corvus X-35 contract clause requiring a prime contractor from responding to take over work normally done by other types of firms.

• **Air Force Concept**—This new regulation allows USAF weapons system contract and equipment that procurement of future weapons be guided by that principle. It specifically assigns the areas of responsibility in weapons system development and production between Air National Command and ARDC as follows:

• **AMC** will procure weapons system and subsystem development and subcontract development for production of both.

• **AMC** is charged with maintaining close coordination of procurement, availability, maintainability and other logistical factors during development and production phases.

• **AMC** is charged with maintaining close coordination of all engineering aspects of weapons system development. ARDC will ensure development of major subsystems to ensure that development of "integrated parts" is created when government-funded aircraft equipment at standard USAF equipment is available or under development.

• **AMC** will require all design, qualification and installation data for all items in weapons system and subsystems.

• **Procurement**—In working procedures to be followed by AMC and ARDC in weapons system procurement, the new regulation establishes four categories of procurement and lists them along with the types of equipment to be provided in each category as follows:

• **Category One** involves direct procurement by USAF from the weapons system contractors and includes engines, landing gear, wheels, brakes, tires, fuel, hydraulic actuators, pumps and valves, oxygen life support, monitoring and

test, assembly, engine equipment, external fuel tanks, radars, navigation, weapons, sensor electrical equipment, electronic systems and electronic communications (Group A).

• **Category Two** involves direct procurement from development by USAF from equipment manufacturers and production performance specifications passed by the weapons system contractor and approved by ARDC. For production, USAF buys directly from equipment manufacturers using detailed design specifications resulting from the subcontract. Equipment in Category Two will be furnished to weapons system contractors for inclusion in their weapons system to be used in Air Force units in the field for use with weapons system.

• **Equipment** in the category includes major electrical power equipment, non-weaponized sensors, propulsion systems, radar, target, combat identification, weapons, weapons guidance systems, ground mobile guidance systems, flight control systems, bombing and navigation systems, fuel control systems, stabilized mountings, remote control systems, primary weapon control and subsystem development and subcontract development for production of both.

• **Category Three** involves direct procurement by USAF from equipment manufacturers and USAF, either specifications approved by USAF. This equipment will be provided weapon system contractors for inclusion in their weapons system.

• **Category Four** involves direct procurement by USAF from equipment manufacturers and USAF, either specifications approved by USAF. This equipment will be provided weapon system contractors for inclusion in their weapons system.

• **Category Five** involves direct procurement by USAF from equipment manufacturers and USAF, either specifications approved by USAF. This equipment is used for production of the weapons system.

If included, weapons, launch rails and launchers, firefights, sensors, electronic communications (Group B), test, assembly, bombing and navigation, external fuel tanks, radars, navigation, weapons, sensor electrical equipment, electronic systems and electronic communications (Group C), fuel, landing gear, wheels, tires, fuel, hydraulic actuators, pumps and valves, oxygen life support, monitoring and

test, assembly, bombing and navigation, external fuel tanks, radars, navigation, weapons, sensor electrical equipment, electronic systems and electronic communications (Group A).

• **Responsibilities**—AMC and ARDC are given authority to alter the procurement procedures established in the new regulation by joint agreement after a specific review of an individual case where good reasons exist for deviation. Reasonable change might include changing the time factor, status of other USAF developments, and the capacity and capability of particular contractors to carry out the work.

AMC is advised by the new regulation to enforce provisions in all contracts with weapons system contractors pending for USAF approval of all equipment development and production performance specifications by the prime contractor under Category One.

Responsibilities of the two new weapons systems are given approval as follows:

• **AMC** approved of subcontract systems, type of subcontract, price and profit, contract and license, light for equipment, launch provisions of subcontract, type and location of government-owned facilities to be used, quantity of equipment to be subcontracted and level of delivery, of technical procurement and production data.

• **ARDC** selection of type of equipment, approval of performance standards of subcontract, qualification testing of production data prior to production delivery.

In another recent regulation (73-10) USAF formally established the Weapons Systems Office (AVIATION WEEK Aug. 17 p. 32) formerly called the Joint Project Office at Wright-Patterson AFB, Ohio. The Weapons Systems Office will be established by ARDC by joint agreement between AMC and ARDC or by direction from USAF headquarters for each specific weapon system. This is designed to serve as a central point for all military and equipment subsystems dealing with the development and production of the specific system.

The new regulation specifies that these efforts will be handled by a single entity provided by ARDC during in operation and early development.

• **First Review**—Under the new procurement regulation, only one review exists of the approved USAF due to coordination between AMC and ARDC and the requirement of the Air Force Command as USAF material data with research, test and development. Both regulations were in process before General Corvus's report that they published would reflect his position on ARDC and AMC responsibilities and the single prime contractor policy.

Further details on each law. One new regulation will be implemented in actual practice are being worked out by a special USAF industry committee appointed by Gen. Cook in October.

New Wing Boosts Comet 2 Lift

'Drop smoot,' planned also for Comet 3, improves takeoff performance; thrust-reverser reported near.

By Ned McKinnon
(McGraw-Hill World News)

London—A new wing to improve lift is being fitted to the Comet 2 production model, and it is anticipated a reverse thrust low-lift for the big transport's jet engines has entered an important test phase.

The new wing is the shape of that planned for the Comet 3.

Reverse thrust for reduced oxygen can be expected on the Comet 3 before the new larger transport goes into service in 1996. The mechanism probably will be ready before the Series 3 prototype flies for the first time next June or July.

(Editor's Note: For H. M. Lloyd, DH manager at commercial jet, to be an Airframe Wing, representative in Paris Nov. 30 that the company is working on a reverse thrust, "but this won't be ready for Comet 3." He and DH the reports to have emergency drop chute on the Comet 3. Lloyd also said they have notified the Comet's engines all the way to 40,000 ft in flight. The DH official and the second wing reduction and speed, results in a production 11,000 in landing as 1993's new impossible to still Model 2 on the ground," he added.)

• **Thrust Reverser**—De Havilland Aircraft Co. has gained an aircraft with a reverse thrust system, which is established by ARDC. When tested from an inoperative engine test work, the developments are not far from the flight test stage.

There was also seen the mechanism to be a simple storage after, several annual updates of the Comet 2's two revised Area jets in the market after the new aircraft and storage mechanism, which is also in diverting the jet stream through 184 deg.

It is reported that the mechanism will be used only in the event of a possible explosion for the might be the need to adjust the storage before starting.

• **Important Advantage**—The British officials point out that by reducing the thrust that mechanism on two revised jets, "due to the landing, an important advantage is achieved as the aircraft will be able to land on a short runway and to operate, the danger of dangerous complications would be removed.

Inspection is that such a device mounted on an engine pad outboard

Comet Backlog

London—New firm contracts for the De Havilland Aircraft Co.'s jet transport have increased the number of Comet 3s on order to 10 and added the Series 2 order to 10. Twenty-one Comet 3s and 13s are in operation today.

British Overseas Airways Corp. ordered five De Havilland Comet 3s and began its first delivery on the day in 1995. Other customers Pan American World Airways, three, with an option on an additional seven; Air India, two; Canadian Pacific Airlines, contracted for three Comet 3s (AVIATION WEEK Nov. 30, p. 39) and took an option on a fourth. BAC was also ordered to transport six, with the first scheduled for delivery early next year.

Other orders with firm contracts for Comet 3 include Air France, Thai Airways, and Japan Air Lines.

on a thick wing used would be of dubious utility. In such case, failure of one mechanism while starting the other would not be an immediate threat on the ground.

An Airframe Based possibly will use this argument to further evidence of availability of based engines in civil aircraft (AVIATION WEEK Sept. 28, p. 34).

• **Drop Boost**—An reported after (AVIATION WEEK June 15, p. 12), the wing proposed for the Comet 3 is designed to give a greater coefficient of lift without increasing wing performance.

This is done by altering the leading edge of the lower Comet wing design and the upper, as well as, a slight drop smoot.

• **Cost Reduction**—De Havilland to adapt this wing for all Comet 2 production types and the Comet 3 came in a direct result of the Comet 2 crash in Kent on October 1972 and in Karachi in May of this year.

Both these reports (illustrated that under certain conditions of low speed and low altitude, as both cases, it is a lot less easy for Comet pilots to stall on takeoff than not following some standard procedure in the latter. Both at Ramat and Karachi the pilots' right of attack was indeed caused during

to present the aircraft from becoming airborne.

Immediately after the Korea crash, Comet operating manual was changed to require pilots to keep their nose-wheel on the ground until clutch speed had been built up.

For Comet 1 operations, they had proved adequate protection. But for heavier Comet 2 (maximum weight 120,000 lb.) there was some question that additional wing hardware would be necessary to overcome fully the drag of a streamliner of the Comet and Korean incidents.

Talbot's Problem Solved—The new wing also solved the problem of allowing the Comet 2 to operate up to its maximum weight in all conditions.

De Havilland said not alone figures to illustrate advantages of the new wing, but ARL has seen the wing in service on a Comet 3 prototype and claims the tailoff problem has been solved. Present operating procedure will be kept, even with the new wing.

Engine Performance—De Havilland claims that the new wing will not affect cruising speed.

Engine ratings for the Comet 2's four 6,100 lb. thrust Rolls-Royce Avon RA 9 jets will be affected only slightly by the new installation.

But the present 6,320 lb. rating of the B.A. 9 is slated to increase up to 7,200 lb., improving cruise and takeoff.

Roll Speeds—The new wing, by contrast, will ease slightly the ground speed problem of civil jet operations—landing speeds.

As the Comet gets heavier, tail speed on landing becomes a more acute requirement.

The Comet 2's stall speed at maximum landing weight is said to be greater than that of the Series 1, the latter being about 105 mph. The new wing will narrow the gap.

But the new wing, by its own terms, going to solve all landing problems of the De Havilland transport—especially those of the heavier Comet 3 (all-up weight 145,000 lb.).

Ultimately, both U.S. and British manufacturers agree, some mechanism to remove the threat of a jet will be needed to allow heavy jet transports to land on most of the world's airports.

Engine the Key—If the new Comet wing and the engine thrust mechanism are as successful as the British contend, they will go along very handily bridging the gap between ARL and Civil Aero traffic. Administration over consideration of the Series 3.

Evidence of tailoff and stall are high on the list of subjects as which CAA jet evaluator George Holdeman has said he wants more information.

Correspondence between CAA and ARL has started again, looking toward a new visit by Holdeman next spring to use the new Comet 2 wing in action.

More Titanium a 'Must': Talbot

USAF's chief calls for immediate action to increase production of the metal; anticipates support from Wilson.

By Katherine Johnson

An Air Force Secretary Harold Talbot has added momentum to a demand for greater and immediate action to speed the U.S. titanium capacity study and supply.

He described titanium as a "must" for aerospace as power in the future and called for vigorous and immediate action to increase production. Talbot anticipated that Defense Secretary Charles Wilson would support his position.

"We are working well in producing 2,000 tons a year," Talbot said. The Senate Strategic Metals Subcommittee, headed by Sen. George Malone.

Fast Gap—Responding to the chief's advice on titanium in the early gap between titanium supply and demand to the subcommittee's record, developed at previous hearings at which Air Force and West Coast aircraft manufacturers appeared. (Aviation Week Oct. 28, p. 14; Nov. 5, p. 22).

Key Player, based chairman of Cassin Wright Corp., estimated that at titanium was barely available his firm could use 34,000 tons annually by 1956 in the commercial and military engine projects to build.

This would require a titanium supply output of 100,000 tons, allowing for waste in processing and manufacturing the engine parts, especially the engine support output by 1955 under present plans in 11,000 tons.

William O'Brien, chief development engineer for Republic Aviation Corp., emphasized that titanium is essential for high-speed fighter aircraft and general aviation now approaching production.

Leo M. Sawyer, president of Ilwaco Machine Co., expected that a private survey indicated that by 1955 aircraft engine manufacturers could use 30,000 tons of titanium annually and an additional 30,000 tons each successive year until a maximum requirement of 250,000 tons a year is reached.

He and engine manufacturers have submitted a similar requirement estimate, bringing the total to 160,000 tons a year.

Urgent Program—He and engine manufacturers are urgent to develop programs that indicate the urgency of the titanium production expansion program.

New Survey, Air Force and the Office of the Assistant Secretary of Defense for Supply and Logistics, headed by Charles Thomas, are launching a new review that is expected to result

in a major increase in Defense Dept. metal effort titanium requirement, set two years ago at 15,000 tons annually by 1956.

Program on OASD, The new requirement study will bring heavy pressure on Office of Defense Mobilization to raise the ceiling of 25,000 tons a year to the titanium expansion goal. GDM at first set Defense Department's 15,000-ton-a-year commitment to 25,000 but increased it that amount to 25,000 tons.

The Malise subcommittee plans to confront GDM chief Arthur Flemming with the testimony of the aircraft industry on requirements of a hearing in the near future.

General Services Administration's chief, Edward F. Marston, has issued the Senate subcommittee that the report for a report on a contract for the full 25,000-ton expansion authorized by GDM.

So far, GSA has contracted for only 12,500 tons a year, 6,000 with Cassin Wright, 6,000 with Titanium Metals Corp., and 7,700 tons with the Port of New Orleans Corp. in private facilities, the Port is producing 930 tons a year. This would bring the optimum 1956 output to 13,300 tons.

New Expansion—Producers are ready to expand with government assistance. National Research Corp. and Mon Metals Chemical Co. reported they have a program for a 6,000-ton-a-year facility using a new, waste developed process pending before GSA.

Hammann, Inc., is ready to construct a plant giant to test use of two processes it has developed.

Elvira Metallurgical Co., a subsidiary of Union Carbide and Graphite Corp., will put up expansion money to construct a 10,000-ton-a-year facility, with increase of government participation of production. Titanium Metals is another candidate for further expansion.

DePaul, however, is doubtful. "I feel that, from an economic point of view, we have not expanded at the present time but should devote our efforts to the development of programs having already proven promise of producing titanium in great quantities and at a low cost," he said.

Good Quality—Improvement of the quality of titanium, poses a problem for the industry that is looking out for the military and industry.

Aircraft and engine manufacturers estimate that a 30,000-ton-a-year

of 140 to 150 tons-a-year on titanium alloys is required.

The business aspect stipulated in the Titanium Metals contract, first to be awarded, was 125,000 tons, and results of the firm's production has been noted because of poor quality. As a result, instead of reaching its capacity output of 3,000 tons a year in September 1953, in the contract called for, the firm is not expected to reach this rate until next year.

Increasing—Difficulties—Meanwhile, aircraft and engine manufacturers are expected increasing difficulties in obtaining titanium.

One aircraft engine program alone will use up about three-fourths of the 1954 output of 13,300 tons. William Hammann, chief manager of Port & Wharves Aircraft, estimates his company would require 4,000 tons for the J57 program and that its branch Good Metals Co., would require about 1,800 tons.

Titanium allocation program is on a voluntary basis. An allocation is no more than a letter to say. As competition for the metal increases, manufacturers, with those with aircraft, appeared likely for difficulties.

From the long-range view, Army and Navy, as well as the air arm, promise to become heavy users of titanium—adding to the competition for the metal.

R&D Chief Outlines Research Policy

The Defense Department has taken no steps to decentralize basic research but will contract its support to those fields with a high probability of producing results for military service, said Arnold A. Quisenberry, Assistant Secretary of Defense for Research and Development.

Certain basic research "of marginal relevance to the defense situation" will be shifted to the National Science Foundation, Quisenberry said the Stanford Research Institute at San Francisco.

Quisenberry said the military will spend approximately \$1 billion in 1955 on 6,000 separate research and development projects, approximately two-thirds will fund the annual research project prior to the Korean War.

Method of Operation—An increasing Defense R&D activities (Aviation Week Oct. 26, p. 9). Quisenberry said that each of the three services will lead individually responsible for seeing that its own program is carried out.

Resolving, relative to the state of the art and the character of success.

Sound in advance to supportive needs not in progress of other military activity.

Coordinating—Committees—More than a dozen coordinating committees, one for each major field of activity, will plan

and coordinate the R&D programs, Quisenberry said. Each will consist of representatives from the services involved and from Quisenberry's office.

"If the coordinated areas of activity are not carried out, they will be accepted," he added. "If there is a dissent, including a dissent by the Department of Defense, we will have to refer the matter to the Secretary of Defense."

One of most people of civilian scientists will be formed to serve as consultants in each coordinating committee. These people will coordinate between R&D board groups in making up but will function only as an advisory capacity. Quisenberry said that private research groups, like SRI, and industry companies be making experts available.

Aviation Needs New Sales Effort: Ashman

The advent of a boy's market in aviation following a 20-year effort's market makes a much necessary that the industry should a strong sales campaign.



LOCKHEED 022, predecessor to Fieser's 022 concept, with designer Rex Lohse (seated).

Mach 2 Forecast for Leduc 022

(McGraw-Hill World News)

Paris-French scientist designer Rex Lohse says he expects his first supersonic aircraft to fly in 1957 and predicts it will reach a speed of Mach 2 in level flight.

The Leduc 022 first in under construction while new test engines contract with the G2 (Aviation Week June 29, p. 9), but in a more of experimental nature.

Industries, sponsored by the French Air Ministry for development of a supersonic design.

34,000 hp—Leduc says the 022 develops the equivalent of 34,000 hp, as has a low-level cruising rate of 39,370 ft per sec. at Mach 2. At 45,000 ft,

most units, says J. E. Ashman, president of Air Associates, Inc., Teterboro, N. J. "There is no any home or quick way out for anything else about it," he said. The 11th annual meeting of Aviation Distribution & Maintenance's Assn. at St. Louis.

Business Hypothesis—Ashman blamed the long-term seller's market for halting a "state of ignorance" in business and cited the one-time company's lack of changing the sales manager's title to "contract coordinator."

Ashman said time and talking are the only means of obtaining effective results in rebuilding a sales organization, distributing information and other promotional techniques as valuable tools, not presents.

New Officers—At the closing session of the meeting, delegates elected as president Lawrence F. Symonds of General Aircraft Corp., Detroit. James Randle of National Aeronautics Corp., Andover, Pa., and R. S. Northington, President Aviation, Inc., Washington, N. C., were named vice presidents.

having been stayed almost unchanged.

- **Finance:**
 - With an increase of working capital of only \$20 million from 1959-62, the 12 major aerospace manufacturers were able to finance a \$575 million increase in accounts receivable and inventory.
 - Working capital turnover rose increased from 4.8 times per year in 1959 to 52.1 times in 1962.
 - During the 12 years for which reports are available, the number of aircraft production, aircraft and parts which had money if almost equal to the number which made losses.
 - From 1957 to 1962 the 12 major aerospace manufacturers paid out federal taxes of \$1.4 billion. Their net profits were \$537 million.
 - In the 12 years from 1949 to 1962, only once was the aircraft industry profit rate higher than that of all manufacturing industries in 1941. In eight of the 12 years, it was less than one-half of the rate of all manufacturing industries.
- **Military Aviation:**
 - About 10 cents of every dollar's worth of goods and services which this country produces goes to military aviation.
 - In fiscal year 1955, we spent about \$22.5 million per day for aircraft and related procurement. This is almost as much as we spent during the entire year 1913.
 - We lost 1,247 aircraft in the Korean war but lost only 1,115 enemy air craft destroyed.
 - The average empty weight of Air Force planes accepted during 1951 was 12,600 lb., that of Navy planes, 8,400 lb.
- **Airlines:**
 - This is the time and the cost for a passenger to go from Pittsburgh to Philadelphia: 1842, stagecoach, 6 days, 827, 18 1/2, rail, coach, and stage, 4 days, 515, 1955, train-coach, 6 hr., \$11.00, 1957, train-coach car, 6 hr., \$18.25, 1958 airplane, 1 1/2 hr., \$16.75.
 - As of June 30, 1953, the airlines owned about 1,700 airplanes valued at \$460 million.
 - In the year ended June 30, 1953, the airlines flew as many revenue passenger miles as the domestic trucking fleet in 1949.
 - Cargo carried by aircraft has grown nearly 15-fold since 1945. 30 per cent of all cargo and irregular carriers' cargo, as well as the aircraft's cargo and freight business has grown sevenfold.
 - Mail, which constituted 17.7% of the operating income of domestic scheduled airlines in 1955, constituted only 2.7% in 1962.
- **Helicopters:**
 - Approximately 3,800 helicopters have been produced in the last seven years.
 - Current helicopter industry production is about 50,000. Six manufac-

turers are in active production on 15 models.

- **Utility Aircraft:**
 - Utility aircraft production will reach 4,000 planes in 1963, highest production since 1949.
 - A four-seater airplane can be flown at 1.7 cents per mile if sold \$300 to per year.
 - **Exports:**
 - Since 1950, more than 4,000 military aircraft have been shipped overseas to our allies.
 - Value of aeronautical exports, Military Defense Assistance and other shipments will approximate \$900 million in 1963.
 - From 1945 to 1952, the U.S. exported 243 new passenger transports valued at \$311.4 million and 5,283 utility aircraft which were valued at \$18.5 million.
 - **Foreign Airlines:**
 - In 1951, orders of the world fleet more than a billion miles, earned 45 million passengers nearly 25 billion passenger miles.
 - British exports in 1952 were valued at \$121.6 million, compared with \$403.2 million U.S. exports. But British exports make up a very much larger percentage of value of total production of five countries.
 - In 1952, Canada exported \$102.7 and five months of aeronautical products into the U.S.—the first time such exports were significant since World War II.
 - **Shocks:**
 - Export investment in the U.S. is \$10 billion—\$6 billion has been spent for military exports, \$4 billion for civil exports.
 - In fiscal 1953, 3,700 Navy and Marine pilots got their wings. Air Force does not disclose its output of pilots.
 - In 1953, 24,000 engineers will graduate in the U.S. In the Soviet Union, the number of graduates will be 32,000.



BUREL-DUNCOIN H1, prototype of H.D. 32 first ordered by Air France to replace DC-3.

Air France Orders H.D. 32 Fleet

(McGraw-Hill World News)

Paris—Air France has ordered 34 Burel-Duncoin H.D. 32 two-engine transports, the airline announced last week. This is the largest number of planes Air France has ordered from any French builder, and it is the first placed for the H.D. 32. Burel-Duncoin expects the order to be followed by contracts from other carriers, both French and foreign. The builder hopes to bring orders for the high-speeder into mass production by 1960. Deliveries to Air France are scheduled to begin within two years. The H.D. 32, successor to the prototype

H.D. 31, will be a DC-3 replacement on French and French Empire bases. First prototype of the 32 is nearing completion and is expected to make its initial flight before year's end. Testing will be brief because the design (Aviation Weekly Apr. 22, p. 40) already has been proved thoroughly in the H.D. 31, which is almost exactly the same plane except the 31 has more powerful engines—a pair of 1,200-hp Pratt & Whitney R1080s against 800-hp Wright Cyclone GTBAs in the H.D. 31. The H.D. 31 made its first flight last Jan. 27.



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Air Brokers Mate Planes, Cargo

Baltic Air Exchange in Britain speeds freight shipment by bringing together the carriers and the shippers.

London—A modern development of a 20-year old British institution, active as a clearing house so long together on the one hand scheduled airlines and charter aircraft agencies, and on the other shippers of cargo and consignees of various air passengers.

The modern development is the Baltic Air Exchange, and it works between noon and 5 p. m. on the floor of the Baltic Exchange, which has been re-wiring their clerks and the dispatch of merchandise by two continents.

Speed to Sell—Speed is a key factor in the operation of the air exchange. In one case a passenger was lost 30 minutes after he had approached the bureau.

In another, a cargo of machinery was on its way overseas when four hours

The air exchange was organized in 1917, although plans for an air network as the Baltic Exchange had been discussed before World War II. In 1949, the *Aviation News* was founded to promote use of the air exchange.

As new cargo built up into operations, the broker expect costs to drop appreciably.

Global Service—Even now, members of the air exchange believe that their worldwide contacts enable them to keep charter costs to a minimum. This is a result of their ability to dig up freight shipments for return trips, so only 40% of the charter flights come back with empty holds.

Despite the name "Baltic," the exchange is far from regional. Much of the work it handles is in countries remote from Europe, involving foreign aircraft flying routes that never touch on England or U.S.

Charter flights are not always merely "out and back," either. Not long ago, one independent United Kingdom crew set up a long-distance operation, completing a number of continuous, though separate, charter flights totaling over 13,000 miles, to Japan or India, thence to South America, back landing through India and North and West Africa with a variety of cargoes and passengers.

In listed form without a hitch. The same company has since retired out with a York, a journey of some 14,000 miles.

New Routes—Until quite recently, the most widely known type of non-passenger aircraft in use of the shipping connections of the Baltic Exchange had been in the service of armies and ships' spares. Now, however, increasing interest is being taken

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Gilfillan
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in ground cargo, and many operators are being made by competitors.

Also, independent operators can now apply to operate new routes. More than 100 such applications have been sent to the Air Transport Advisory Council by these companies, including a number for overseas routes. Operation will be granted licenses to maintain scheduled services for seven to 10 years, thus enabling them to plan ahead with confidence and to attract badly needed additional capital to the industry.

► **Big, and Growing.**—The independent operators are already making a notable contribution to the total capacity of Britain's merchant air services. As the new and larger aircraft come into commercial use, they expect to broaden their activities, particularly in new areas and difficult territories.

Growth of the freight volume carried by Britain's airlines has been dramatic. On international scheduled services, operating to a regular timetable, cargo has multiplied threefold in the past three years. Passenger traffic has gone up 84% in the same period. Freight charges have added considerably to this volume, and the traffic carried in members of the British Independent Air Transport Association went up 100% in the last year.

British European Airlines carried 99% more freight last year than the year before.

In their last financial year, British Domestic Airlines Corp. carried an average of over 144 tons of freight every day, representing a rise of nearly 150% over the total of three years before. In addition to cargo carried on the freight hauls of these passenger services, the competitive operators regular freight services between London and Singapore with stripped York aircraft, carrying bulky cargoes such as machinery and automobiles.

► **Chaired Jumping.**—Britain's mail-clasped air ferry across a widening sea stretches farther. A talk recently indicated that the movement of 2,800 head of cattle in the Channel, perhaps the largest aerial movement of cattle to date.

Another large-scale job was the removal of the office equipment and furniture from the 130-room headquarters of the North Atlantic Treaty Organization in London to its new home in Paris. The movement of cumbersome equipment weighing over nine tons was completed in five days. An interesting point is that this air operation was not expensive; it saved the overall cost only slightly, due to the substantial room-over-rental in packing and insurance.

► **Ask the Experts.**—Britain's operators, who today are among the most advanced in the world, are being backed up by freight facilities that enable them to build up new overseas facilities.

Shippers can be flown out to individual markets in a few days, and an efficient space and replacement service guaranteed in remote areas. Pallets can follow up their own freight when others quickly and intelligently.

In a recent instance, demand control for a certain type of engine filter by advertisements at Canadian newspapers was rapidly printed by the United Kingdom producers who flew supplies across the Atlantic.

Regularity of Britain's freight services is encouraging a new type of shipping services. A list of shipper needs can be made up, or, for the most part, can be made up, or, for the most part, can be made up, or, for the most part, can be made up.

The confidence that replacements in replacement of stock can be obtained in a matter of days from England.

A system which is helping manufacturers to meet their delivery dates is accepted once certain scheduled routes by BOAC whose cargo services office helps space allocations in services to their shippers may be better than their cargo needs will go of specified times.

► **Special Rates.**—For large cargoes of particular cargoes of goods traveling frequently to some overseas destinations, BOAC has introduced special commodity rates. Among products for North American and European countries qualifying for these rates at present are

external

stores

housing

by EDO

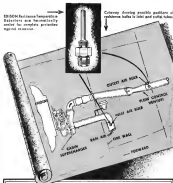
Housing electronic equipment and houses which might cause interference often presents problems as difficult as the design of electronic systems themselves.

Take one example—a powered external heating capable of being flown in the transonic speed range and meeting all environmental trials. From wind tunnel tests to complete testing and manufacture, Edo solved the electronic manufacturer and strength builder of the many problems involved.

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When it is unexpected a couple a tachometer driving to the high speed running shaft, the RPM of the shaft can be determined by the instantaneous curve plotted from the two pressure differential between the inlet and outlet nozzles.

With one billion detectors in each foot, the difference is important: a micrometer and then varied in a same type software and is exposed in EPJ. A separate data bridge circuit provides to constant waiting whenever the differential reaches the preset alarm value.

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Apart from speed, an advantage which is gaining popularity for its light is the simplicity—and consequent lightness—of the packaging required.

A taxi, wishing to report a stolen suitcase to Africa, brought it to the wrong terminal parked in a street where the Subsequent arrived at this structure, reduced the height to be 53.40.

Other advantages are lower handling costs and good safety factors. Because two separate components of Swiss-made lighting tubes, sent by surface transport to Greece, were found on arrival to be damaged. Replacements ordered out by air arrived in perfect condition.

• **Chicko and Chocolate**—An export to the north from the forests to the coast—from a day-old chick to a 12-hour chocolate-making plant. But even chocolate is new not so much for them but as the regular carriage of various commodities is daily demanded, such as pharmaceutical products, medicinal plants, cut flowers and women apparel. An exception perhaps is the transport of livestock.

Every third or fourth percentage of British Overseas Aircraft Corp. orders

Expansion of this trade has produced a new building at London Airport—hostel for animals, built by Byston's Royal Society for the Prevention of Cruelty to Animals at a cost of 550 000. It is equipped with an ambulance and mobile x-ray unit for sick animals.

PAA-EAL Interchange Approval Renewed

Approval of the voluntary New York State's Aerospace interchange contract between Pan American World Airways and Eastern Air Lines upon has been recommended by Civil Aeronautics Board examiner Thomas Wren in the controversial Ralston union case.

GAB two years ago reversed Wynn's recommendation, but Presidents Eastman and Wynn returned the GAB options for Board review. The Board has focused facing competitive overbookings of British Airways with Eastman and Pan Am/Ansett with Nakase.

Enomoto requested new evidence in the case. Enomoto Weiss sent her recommendations of two years ago stating that the new evidence does not alter his previous conclusion. Weiss also recommended that the Board should consider a Russell National Commission if it is voluntarily created.



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LOW ASPECT RATIO
STRAIGHT WING FIGHTER

'Kelly' Johnson Looks at Delta and Swoop Designs, and Finds . . .

Thin, Straight Wings Best Up to Mach 2

Lockheed engineer says delta and swept wings do not match lift or handling features of straight foil.

"Sides are bad things in engineering," says C. L. "Kelly" Johnson, Lockheed chief engineer, who takes a dim view of the aeromachanical fashion trend toward the triangular silhouette.

So he proposes a further critical evaluation of wing and tail planforms for supersonic flight. Out of his analysis comes a strong argument for the concept thin wing of low aspect ratio, a Lockheed design trend which has been accepted only once in recent years with the one-way XP-59 postwar fighter of 1949. Johnson's views were presented in a paper at the recent Society of Automotive Engineers' National Aeronautical Meeting.

Johnson makes his design comparison on the basis of what he calls the "real cruise problem." The first criterion he compares is equal field length, he further specifies that the same mission and the same payload or equipment are additional criteria.

Then, choosing his working speed range from Mach one to two, Johnson sides, likely to conflict against the proponents of the delta and the swept wing.

► **Flat Arguments**—There are when

types of the straight wing, says Johnson a better landing and takeoff characteristic than either delta or swept wing. ► **Stability** advantages over the delta at high angles of attack. ► **Higher** lift-drag ratio than a compact delta.

Straight-Wing Defense

First shown on the Douglas X-3 research aircraft (Aeronautics Week Nov. 23, p. 33) might have prompted these two immediate responses:

► Is that all the wing can do?

► Why did Douglas see a straight wing?

The design story on the glancing X-3 mission is to be told, but there is a spokesman for the simple geometry of a straight wing.

"Kelly" Johnson, Lockheed's chief engineer, made a strong case for the straight layout recently. Speaking at the recent SAE National Aeronautics Meeting and in discussion of the opinion of Lockheed's own straight winged F104 fighter, he defended its proven thrust layout in an economical world of missiles and swept wings.

His arguments, detailed on these pages, could also apply to the design of the top wing of the X-3.

► **Maneuver** unable lift is more than twice that of a delta, and about half again as much as that of a mixed delta. ► **Overall** stability and control is superior to other planforms.

The major problem with the straight thin wing will be one of better and more-effective effects, says Johnson. Stability at high speed will be about the same as the delta, and will no doubt call for artificial stability devices, and because the limited characteristics of these wings at high lift are largely unknown, "we may have to accept some transient buffeting."

► **Lockheed Study**—Most of Johnson's information was furnished by the results of a flight design study Lockheed made in 1945.

The final configuration was a rectangular delta, it was discarded as a design after a drag evolution through the transient stage showed its superiority in other wing configurations.

Drag evolution was merely the last straw, according to Johnson. Before that, the Lockheed design team found that the weakness would be drastically unstable at high angles of attack, stability control below the stall.

When test studies were made, they discovered that there was a great loss of lift when the wing was twisted for any given angle of attack. "They were able to get suitable trim characteristics by moving the wing section foreward of

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1947 STUDY concerned *Leptothorax delata* was not, contrary to high-speed prediction.

• "There has been very limited experience obtained with delta wing type aircraft."

Says Johnson: "After years of drawing wings in the expert size range of from 6 to 12, it is hard for a designer to bring himself to draw those of 1 and 3 in rectangular planform. When he does, it becomes immediately apparent that the delta version has no inherent advantage."

TYPICAL VEHICLE	ECONOMY LITERAL (MPG)	CITY FUEL CONSUMPTION		HIGHSPEED FUEL CONSUMPTION		COMBINED FUEL CONSUMPTION		FUEL CONSUMPTION PER MILE (GALLONS)	FUEL CONSUMPTION PER MILE (LITERS)
		MPG	MPG	MPG	MPG	MPG	MPG		
1970	14.5	12.7	15.5	14.5	14.5	14.5	14.5	14.5	14.5
1975	17.0	15.0	18.0	17.0	17.0	17.0	17.0	17.0	17.0
1980	20.0	17.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0
1985	23.0	19.0	24.0	23.0	23.0	23.0	23.0	23.0	23.0
1990	26.0	22.0	27.0	26.0	26.0	26.0	26.0	26.0	26.0
1995	29.0	25.0	30.0	29.0	29.0	29.0	29.0	29.0	29.0
2000	32.0	28.0	33.0	32.0	32.0	32.0	32.0	32.0	32.0
2005	35.0	31.0	36.0	35.0	35.0	35.0	35.0	35.0	35.0
2010	38.0	34.0	39.0	38.0	38.0	38.0	38.0	38.0	38.0
2015	41.0	37.0	42.0	41.0	41.0	41.0	41.0	41.0	41.0
2020	44.0	40.0	45.0	44.0	44.0	44.0	44.0	44.0	44.0

FLAME RETARDING Inc. of Danbury, Conn., uses Tinkler to protect roller bearings on the base rest of its probe and design a cable-reeling system to ensure dependable, accident-free performance. Missing details are well-classified information.

FUELING a combat pilot at mid-air is as tough job as any he can do, and so it's no wonder it has been the real test in one war, mostly and steadily, since the dawn of aerial warfare. And now, under new flight conditions, there's Why the Right Refueling has of Embury, Conn., use two Timken tapered roller bearings in the base and rear of its probe and clamping in the rotating section.

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staircases in more difficult geometry were constructed by means of a special apparatus using several pairs of wooden beams, 75-100 mm diameter, to support the vertically moving carriage system mounted on the vertical columns.

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Douglas designers specified Kamloc fasteners for the all important engine cowling and for inspection panels throughout the giant DC-7. Kamloc quarter-turn fasteners save time and money in both installation and operation. Kamloc fasteners are positive, because their combination cam and spring action makes it impossible for vibration to shake them loose.



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the standard advantages that go with low aspect ratio.

►Not Tuller-Johnson says that the delta winged airplanes make up for their lack of horizontal tail by acquiring a "pseudo vertical tail." Pseudo measurement of contemporary types, he shows that the total surface area of the delta-without horizontal tail-is, in some cases, as much as the area of conventional wings with the horizontal tail.

Furthermore, he says, the low wing loadings that are required to get across the take-off and landing distance for a delta result in higher surface area per pound of gross weight than conventional types.

The overall delta performance can be improved by the addition of a horizontal tail with some reasonable tail length, Johnson states, and then you can carry higher wing loadings.

One of the primary advantages related to the delta is the availability of space within the wing. Johnson says that right at take-off speed requires wing thicknesses so low that this advantage disappears.

Aircraft delta designs show that fuselage connection and length are as good for the delta as for the conventional airplane, and Johnson adds that it is possible to reduce the cross-section of engine, equipment, ducts in the pilot-by the choice of wing planform-to any important degree.

►Counter Design: This adds up to greater drag for a delta at take-off speeds because—over though fuselage drag is smaller to conventional types—lower wing loading and large vertical tail area increase the total.

"A major error in evaluating the delta type is generally made in considering



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Like a powerful telescope, this advanced type radar equipment enables the pilot to study obstacles "line-up" in a choice of five different ranges between 5 and 250 miles. Here is a unique flashlight radar that will readily indicate mountains and more by itself. It can locate landmarks, and other dead landmarks permit the pilot to



navigate in safe course. It can map terrain, showing the pilot the safest clear navigation of the ground he's flying over. It can help the pilot know his place on the desired flight path. It can even be used as a visual check against the landing and approach instructions in his plans.

The new Alcock Radar, made by RCA for the Navy Bureau of Aeronautics, is another landmark achievement worked out in close cooperation with the military to insure U.S. supremacy in darkness. About the RCA engineers and field technicians in your branch of service



wing men without conducting mountain lift and dog at high angles of attack. While the present radar system has some good things of the state, the wing doesn't show up any well with its limited pitch control and low angle mountain lift on takeoff and landing.

Thus he concludes that the unique advantages of the delta type are in its structural rigidity and in the improved speed generally available in the configuration.

•Not Sure? Either—Johnson doesn't believe in the snap-on wing in a car trader with the straight wing at high speed.

That opinion he backs up by explaining that the undesirable characteristics of the snap wing because appears when the leading edge every angle to correct for speed.

Structurally, the snap wing has a high aspect ratio, even though its aerodynamic speed ratio may be low. This means high loadings and wing angles, and aerodynamic problems. Available mountain lift is poor, and there is a way a chance of push up over the stall.

•Straight Wing—Johnson's definition

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It is a good choice for many
applications.



of a straight wing in one which is swept on a line somewhere between 15 and 20% of the wing chord. Such a wing probably must be tapered for structural reasons. If the low aspect ratio of the delta wing are acceptable to pilots, then Johnson is willing to use variable aspect ratios. Then, he says, you have to sweep up your camber and draw a compressible straight wing plan form. With that, it is possible to obtain wing thicknesses of 15% or less.

The major problems are aero-elasticity and flutter, but these are capable of solution, says Johnson.

The straight-wing airplane will have the worst sort of stability problems that have been bedeviling aircraft designers for years, and in conjunction with all low-aspect-ratio layouts, will probably require artificial stability devices to take care of the combination of lateral and directional effects.

Specifically: To illustrate the point, Johnson makes a drag comparison of the typical tailfitter at Mach 0.85 and Mach 1.5. At the higher speed, the drag has been increased so 50% of its aerodynamic value. In the breakdown, wave drag—negligible at subsonic speed—becomes extremely important in the supersonic range. Pitching moments of wing and tail count measurable amounts of trim drag.

Thickness drag is extremely important in the supersonic regime. At Mach 1.5, for example, a 5% wing has only 25% of the drag of one that is 5% thick.

Subsonically, the situation is reversed to some degree because of flow separation at the leading edge of the thinner airfoils.

Johnson points out an omission of early design studies. They assumed that the variation of the airplane efficiency factor "C_D" and in the denominator of the equation for induced drag coefficient because constant at increased values of Reynolds' number. But this is not so, he says, and thus the earlier studies developed substantial errors.

Mass Comparison: Considering a lot of aspect ratio, Johnson shows a graph which plots drag against Mach number for two aspect ratios. "There is nothing good aerodynamically about

If this man were free to speak...

Much of his thinking is classified as *Security Information*. Much of his mind is pledged to silence, for the love of his country and the future of our world. But this much he can tell.

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low aspect ratio," Johnson points out.
But it is required for highspeed airplanes
in order to get low thickness ratios.

The consequence has been acute with
a wing loading combination, because as
much of the wing area of a low-aspect-
ratio wing gets buried in the aircraft
fuselage.

True drag is important for the tail-
plane, although in the case of the delta
it is a considerably lesser. In a case
of curved values of maximum
lift-drag ratio, the delta shows a con-
siderably lower value over the subsonic
speed range.

Lift Characteristics—The best place
from obtaining optimum results is
in the straight wing, says Johnson. Lead-
ing-edge and trailing-edge devices are
extremely effective. For a given wing
area, most unstable area is outside the
fuselage to be affected by lift devices
and to develop lift. The shorter delta
regains less drive load on the tail for
turns.

When comparative maximum lift is
plotted for the delta, tail delta and
straight wing, the straight wing is su-
perior.

Stability problems are common to all
supersonic airplanes, says Johnson,
where the delta has low aspect ratio
and high sweep in the wings and a long,
dense fuselage. He looks for the yaw
and roll dampers to become standard equip-
ment.

At low angles of attack, flight
characteristics are well to be con-
siderable, but at high angles, problems still
exist.

Some types, according to Johnson, ex-
hibit tendencies to lose or sustain all
directional stability and "snap rolls" at
high angles of attack. Some others will
have high rates of roll just above stall
speed.

But there is hope; the transonic tran-
sitions which plunge designers into
will automatically disappear with re-
duced wing thickness and better aerody-
namic form.

Considering his stability comments,
Johnson says that Lockheed tests have
shown that overall stability and control
characteristics are superior for the
straight wing aircraft with a proper tail
over other types.



Valve Talk

for Wm. R. WHITTAKER CO., Ltd.

by Morris Allen,
Editor, Aviation Writers Area.

Knowing the delivery of the subject, and not being one to
avoid a controversial issue, I agreed what turned out to be a
rather lively discussion, with the question:

How does the Whittaker Company feel about entertainment?

Vice President Glenn Whitaker, who turned out to be the
spokesman for the group, began:

"Unfortunately, Dave, the word entertainment has gained a
bad name in government and industry during recent years. If
you mean the lavish meals, big parties and hyperactivity—and
expensive—attention that has received bad press in past years,
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sound pricing needs to resort to
bribe and bribe entertainment.

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give to prevent their part from being
"bribe" by suppliers—to buy
business transactions on the table,
imposed plan of paper work.

"We know of cases," Glenn said, "in
which manufacturers have given gifts
which are not employee money even
except a function from a holiday."

"This, to me, would indicate a com-
plete lack of faith in the employee
staying alive as well as being able to
make proper decisions. In my book, any
such decision would be referred to
my form of similar statement—
to be about a business check—should
be final anyway."

Glenn stressed the benefits that
businessmen receive from
spending some of their own time
with suppliers.

"If you get to know a man or his
all faces as well as during his working
hours, you can certainly form a much
better opinion of his products, his
reputation and the value of his work,"
he continued.

Glenn went on to point out that
Whittaker has paid little to its
representatives and added that it is
simple good business to have the com-
pany's customers know their men are
reputable.

"For this reason we have always
encouraged our people to spend as
much time as possible with our
customers," he continued.

"I know from experience that when
our men spend as much time with their
customers, much of the conversation
will hinge around the Whittaker Com-
pany, their products, their personnel,
their history, their plans for the future
and so forth. It is beneficial for the
customer himself to know as much
about our company as he can. You
can't really know a person well, if you
see him only in a business office."

"There's another side to the dis-
cussion, Glenn pointed out. The Whit-
taker Company does not "retire" the
lengths to which some plants have



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Military-Civil Battle Rages Over DME

- CAA resisting Defense Dept. push to make it abandon its present DME for newer armed services' type.
- Outcome of five-year-old conflict will determine future civil navigation system to be used in the U. S.

By Philip Klau

Outcome of the battle now raging over civil versus military type DME (distance measuring equipment) is expected to have far-reaching effects on the U. S., and possibly foreign, civil navigation systems for the next 15 to 20 years.

The controversy is this: Should the Civil Aeronautics Administration abandon its present civil DME system in favor of a newer military version (Aviation Week News 25, p. 18).

Because of the fact that the two versions DME, crossed sharp divergences for years ago within Special Committee 11 and 90 of the Radio Technical Commission for Aeronautics, formed to develop a "common system" of air navigation and traffic control suitable for civil and military use.

The controversy came to the fore in the spring of 1951, following the refusal of the Korean war. It led to mass emigration of the Navigation Committee of the Research and Development Board, and revocation of the authority of the Air Navigation Board. ANB was set up in 1948 to supervise the overall development of the many different aspects needed for the Interim and Ultimate Common System.)

"Whether the currently announced acceptance of ANDB (Aviation Week News 5, p. 105) is a result of the present military civil DME capable is not clear.

► **Military System:** New details have been released on the new military system, called TACAN (Tactical Air Navigation), for security reasons. However, the general characteristics of the system can be gleaned together from information contained in the report by RTCA's Special Committee 11 and guarded statements approved for release.

TACAN is designed to provide a variety of navigation and traffic control functions. A single airborne unit is capable of giving both enroute-type leaving and DME type distance information. The same airborne unit, it is reported, also can perform in a side-

transponder (altitude) beacon to identify the airplane on ground radar scopes. SC-31 expected the single airborne unit also to give information on plane height and to provide voice communications and "private line" communications of standard command instructions from the ground and acknowledge from the air.

No one will say whether TACAN today is capable of providing all of the services mentioned by SC-31, or whether these are objectives for further development.

The system, originally developed by Federal Telecommunications Lab for the Navy, has been adopted by the Air Force for instrument standardization. However, there are critics that some circles within the USAF are not too happy over this policy.

► **Military Proposal:** The military are believed to have proposed that CAA change or convert its present DME versions to the new military system.

If this were done, and new civil airborne DME were designed for the military system, these units would get only distance information when they outperformed the converted CAA ground stations.

Military aircraft, equipped with the full TACAN unit, would get both distance and bearing information. Civil aircraft would continue to use VORs (omni-directional) to get bearing information.

► **Rebels:** The Proposal—Others the military can sell their proposal, they must choose between two airplane alternatives.

► **Set up and operate in the U. S. a military (TACAN) runway system that essentially duplicates the existing civil network.**

► **At the same time, including equipment installation and maintenance costs, it will be moved \$50 million.**

► **Equip aircraft with both civil and military navigation equipment to enable the plan to operate in the U. S. or allow them to pick up at a moment's notice to fly to an overseas tactical area.**

Results for this approach in the cost and trouble of maintaining dual airborne equipment to receive aircraft and, in turn, to find space for them in

Exclusive Report

Reports of top-level Defense and Commerce Department negotiations caused at getting Civil Aeronautics Administration to abandon its present civil DME (distance measuring equipment) system possibly clouds over the present program, despite negotiations from CAA.

These doubts come at a time when the civil DME program is nearly to roll. Many questions are now in question, production airborne units will be available in 30-60 days.

The regulations, behind closed doors, involve more than the future of civil DME. The outcome of the controversy could also reshape the future civil navigation system and in the U. S. and abroad.

To give its readers an insight into the more behind the argument, and some of its important implications, Aviation Week presents this exclusive report.

on packed lighters and intercoms.

► **Private System:** Civil DME proponents say there is nothing wrong with the present CAA system, that it is designed and proven. They say a change would leave CAA to keep some 512.5 million worth of ground stations, half of which already are installed and in use, ready for operation.

The eight top manufacturers (Boeing, Hamilton and Nacco) that have more than \$300,000 worth of orders for airborne civil DMEs and expect to start shipping in a couple of months. Abandoning the present DME, civil proponents say, would shatter the U. S. position with the International Civil Aviation Organization and foreign countries, which only recently began to buy VORs and are presently negotiating for DMEs.

Civil DME proponents say TACAN still has "bugs" in it that they even when these are fixed, the system is not capable of performing all of the functions claimed for it.

They argue that military aircraft of course are equipped and twice VORs and ILS, and should adopt civil DME.

► **Transport Benefits:** Opponents of military DME say CAA's ground systems used not be scrapped, that they

can be converted at relatively low cost. Looking at the overall picture, they say, a change to military DME would benefit the taxpayer.

Military DME proponents decide claims that TACAN does not perform satisfactorily, and say they have proof but cannot show it for security reasons. The civil aircraft sure will benefit by a change to military DME, its supporters say, because a single airborne unit can serve both as a DME and as a radio transmitter (altitude) beacon, saving the expense and weight of a separate beacon. (ANDB has a switch between now under development, Aviation Week 17, p. 418).

The military says it cannot use the civil navigation system in a tactical combat area because it lacks "security"—anyone could use it to give its code. Military also says it cannot afford to penalize performance of air traffic and intercoms by carrying on, or severe weather boxes when the TACAN unit will do the job.

► **Common System:** Changing to the military DME, its supporters say, would put the U. S. on the track of the "ultimate common system" proposed by SC-31 and representing at least the consensus of top military and civil experts.

If this is done, the SC-31 concept of a single box providing bearing, distance, height, radio beacon, private line and possibly voice communications capability will be realized. The present civil DME system, they say, does not have this potential for growth.

Civil DME supporters feel what that the present DME, like VOR, is an "interim" system until a single multipurpose "black box" is desirable. They point to the December 1948 report of SC-49—also made up of top experts, many of them members of the earlier SC-31—that set the standards for the present civil DME.

Based on this report, about 20% of the available radio spectrum (250 mc) was set aside for future civil DME and the remainder was reserved for "the development and adjustment of the next entire portion of the 'ultimate common system.'" So the civil DME proponents say we will end up to a single purpose black box, but not until it is the rest of the technical air spectrum.

But the military says that a full 250 mc band is needed at the same purpose "ultimate common system" is to be achieved. Otherwise it is like trying to squeeze a race 11 feet into a race 10 inch.

► **Fundamentally the Same:** In the face of these sharp clashing road counter claims, it is surprising to find that the two types of DMEs are fundamentally the same.

Both operate in the 1,200 mc region. Both determine distance to the ground

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station by sending out a pulse (or pair of pulses) that intercepts or triggers the ground station to reply with a similar pulse and thus insuring the elapsed time between the interrogation pulse and receipt of the reply.

Fundamental difference between the two types of DME, and the one leading to the present impasse, is the technique employed to give the many repetitive interrogations and reply channels needed to prevent an airplane's interrogation pulse from triggering unwanted DME ground stations in the area. Spurious triggering can overload these ground stations and drive them to a point that is too long to intercept them.

• **Class Chased Vs. Pulse Multiplex**—The civil system divides the 50-mc band recommended by SC-40 into 100 interrogate channels, separated by 25 mc, and 10 reply channels—also with 25-mc spacing.

However, 100 interrogate and 100 reply channels are needed to prevent confusion in high density areas. To provide the necessary channels, pulse multiplexing is used.

This means the civil DME transmits a pair of pulses, modulated by one of 10 different possible time delays between the two pulses (the both interrogate and reply). The combination of 10 different frequency channels and 10 dif-

ferent pulse spacings (modulated), provides the necessary 100 discrete channels.

The military system is designed to use the entire 150-mc band, dividing it into 100 interrogate and 100 reply channels, each separated by only 10 mc. Pulse multiplexing is reserved for times outside interrogations rather than distance.

• **Sharp Disagreement**—Before SC-40 rendered its recommendations in 1945 for an interim DME using pulse multiplexing and 20 mc of the available 150-mc band, the controversy was reported to be here by sharp disagreement among its members over the wisdom of the recommendations.

It is said that Navy and some Air Force representatives felt the SC-40 DME system could be initiated too early when large flights of aircraft depended on its accuracy (carrier or military base).

The Navy was reported to be unable to satisfactorily use VOR as its carrier, because of the uncertainty between distances caused by crossing ships in a tight fleet.

Whatever the reasons, the Navy in 1946 launched a study-development program at Federal Telecommunications Laboratories for a multi-purpose, pulse-type navigation system, which became the present TACAN system. At some later date, USAF accepted TACAN for its future navigation system.

• **Battle Lanes**—The battle lanes are not down, but finally in some sectors. CAA is driving by the ground civil system recommended by SC-40. CAA has in mind its safety in the future and ordered its present system revised to 100-mc. The military, with restrictions on the part of some Air Force personnel is looking the change to its voice.

The military and then Air Transport Association are sitting on the sidelines, waiting for the final. None of the current has decided any DMEs, and they continue



How a B-47 Avoids a Nervous Breakdown

the problem: The "nervous" of the Air Force's B-47 jet bomber consist of a highly-complex series of electronic systems, each one dependent on every other one for efficient operation. These sensitive instruments would be unreliable and subject to failure if not adequately protected against the vibration and shock of landings, take-offs, turbulent air and gun recoil.

the solution: Because rubber or rubber-impregnated shock mounts are subject to rapid deterioration by ozone and low temperatures at high altitudes, and because low temperatures impair their performance, conventional vibration-isolating mountings could not give dependable protection. Robinson engineers developed three separate types of Met-L-Flux[®] mountings which insulate these delicate electronic devices from the shock and vibration caused by landings, take-offs and rough air. These Robinson mounts are now standard equipment for most of the essential electronic devices (including the bombing system) on the B-47. "America's first line of defense."

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USAF Ground Radar

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CONGO 'GOTTER'—Health activities of the Belgian Congo have won a battle against deadly disease-carrying insects. Sikorsky HO4S helicopter spray insecticides as well as landing areas accessible to other aircraft or spray equipment. Longdendale residents are reported now to be safe from malarial insects as are New Yorkers.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS



"BET RUN" RESCUE—Here a Navy HO4S Sikorsky helicopter awaits the landing of a "wounded" man carried in a stretcher supported by poles and Navy jackets. This pickup was part of a practice operation for search and rescue helicopter and survival parties. The HO4S Sikorsky is specially equipped to carry litter patients.



LITTERAL CARGO—This crashed Army L-19 Sioux plane was salvaged with ease in Korea by an Army Sikorsky HO4S helicopter. Two types were loaded by the damaged wings, engine and fuselage (above, in cargo sling) to a repair depot. Army Sikorsky helicopters are now solving hundreds of tough, unusual transportation problems.



SPECIAL AIRLIFT—A wounded veteran, after months as a North Korean PW camp, is carried down an Army Sikorsky HO4S helicopter to a South Korean hospital in Seoul. As in earlier prisoner exchange activities, Army Sikorsky helicopters played a big part in the post-truce prisoner and cargo, providing airlift for repatriated soldiers and other personnel.



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from 20 cps. to 200 kc. A sharp null can be obtained at any frequency from 100 cps. to 50 kc. Manufactured by Ad-dress, 650 Massachusetts Ave., Cambridge 39, Mass.

• **DAC Power Supply**, for converting 115 v., 60 cps. power to 1.2 to 50 v. d.c., met magnetic amplifier to hold output voltage constant to within 1% from no load to full load with a 50% variation of a.c. line voltage, according to its



manufacturer, Int'l. Inc.-Cofed Magna-Volt, the device is reported to have less than 1% rise in ripple and a regulation response better than 9.2 seconds under various load conditions. Address: 3015 S. Main St., Los Angeles 3, Calif.

• **Noise and Field Meter, Model NF-105**, commercial equivalent of the military AN/URM-7, can be used for noise and field intensity measurements in the frequency range of 20 to 1,000 mc., as well as performing as a standard impulse



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more source and sensitive vacuum tube circuit. Manufactured by Eugene Decca Products Co., the device has a single tuning knob for quick frequency scanning and a built-in regulated power supply. Address: 1515 Golf Blvd., Bayville 45, N. Y.

• **Power Amplifier, Model B**, will deliver 275 watts (into a 100-ohm load) when driven by a 10-v signal from a low-level signal generator. Device has main-



tains a flat response from 0 to 20,000 cps, according to manufacturer. Address: Southwestern Industrial Electronics Co., P.O. Box 14056, Houston 16, Tex.

• **Variable Impedance RF Wattmeter, Model 141**, for rapid power accurate measurements in the frequency range of 2 to 10 mc has been announced by Sinton Electronic Corp. Resistance form of device's input impedance can be varied between 5 and 500 ohms; sensitive term can be adjusted between plus and minus 250 ohms. Impedance can be set to an accuracy of 5% and power measurement accuracy is 10%. Manufacturer says. Device can handle up to 250 watts of power. Address: 1649 Redden Ave., San Carlos 2, Calif.



Old and New

New MHI power transistor, rated at 20 watts, is shown alongside various fields of comparable rating by Dr. Fred B. Lenz, research director at Minneapolis-Honeywell. New power transistor, which is being used in a prototype of a transistorized aircraft fuel pump, is not yet in commercial production, MHI says. New MHI development opens many new fields for transistor use.

J67 JET

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TOMORROW!

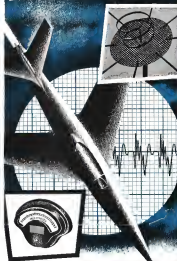
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loading speeds of 6.1 to 168 in./sec. are available through the use of easily changed gears; company says. A "jump switch" permits a 10-fold increase in record speed without stopping the oscillograph. New Type 51118 oscillograph is available. Its operation from either 26 v d.c. or 115 v a.c. input signals whose frequency is 10 to 100 cps. may be viewed in wave form on a ground-glass screen, its special visual check of wave deflection and to insure proper adjustment of galvanometer deflection. All operating controls, test circuits, and waveform indicators are on the instrument's front panel. Weight is 165 lb. (Consolidated Equip. Securing Corp., 380 N. Sixth Street, Waco, Pasadena 8, Calif.)

• **Portable Oscilloscope**, weighing only 28 lb. and capable of operating from 115 v., 50 to 1,000 cps. input, has been announced by DeVost Labs. The new Type 101A has a band width of 50 cps to 4 mc. (20% down) and contains circuits for precision calibration of both time and amplitude. The most user-friendly rectangular CRT is used. Dimensions are 9 1/2 x 6 1/2 x 16 1/2 in. (DeVost Laboratories, Inc., technical sales dept., 704 Bloomfield Ave., Chino, N. J.)

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• **CAA Installs Improved ILS**—Sixty-two ILS installations have now been equipped with an improved "null reflect card" glide slope antenna to reduce beam bending caused by aircraft. CAA reports. As much as two feet of snow on the ground will cause only 1/10 deg. of beam bending. CAA says. New antennas, developed by CAA's Technical Development & Evaluation Center at Indianapolis, also provide more uniform beam direction, regardless of terrain, CAA reports. Improved antenna is going in at all existing ILS sites where type transmitters and should be replaced as needed.

• **MIL Complete 40,000th Autopilot**—Top Air Force officials were on hand recently when Minneapolis Honeywell rolled the 40,000th autopilot pilot off its production line at Minneapolis MIL which entered the autopilot field in 1941 with the Type C-1 used in B-17s and B-24s, says it has produced more autopilots than any other firm.

• **Aerial Camera Computers Ordered**—The Buhl Jack Scientific Instrument Co. has received a \$9 million order for aerial camera computers. The devices are designed to compare plane's ground speed to camera's sync film rate to be viewed at same speed to prevent image blurring. —TK



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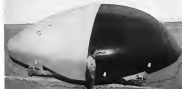
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HUGE MOULD used in making half of radome. Men at right reach a tray to receive bag used to apply necessary molding pressure.

How Mammoth Plastic Radome Is Made



RADOME INVERTED, shows show attachment points (right) and access plate (top left).



RADOME INSTALLATIONS are prominent feature of USAF Lockheed F-104.

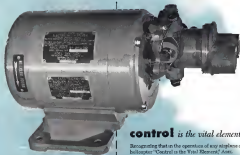
The large war is reinforced plastic structure can take in a modern air craft application as dramatically illustrated in the belly radome on Lockheed's Super Constellation plane now in production for the Air Force (RC-121C) and the Navy (WV-3).

► **Giant Dome**—Probably, the largest plastic structure ever built, this 21-ft-wide, 35-ft-high belly radome structure is 10 ft. along the bottom of the fuselage. It is implemented by an 8-ft. high saddle antenna housing atop the fuselage. Both structures are built by Zoweh Plastics Co., Glendora, Calif., a large-scale producer of reinforced plastic parts for many military aircraft. (Aerospace Week, June 15, p. 45).

► **Published for the first time**, here are details and close-up photos of the belly radome and large radome needed. ► **Making, Side Details**—The large plastic structure is made in half sections to facilitate handling and installation. Both along the longitudinal centerline are used for joining the two portions. Material is a polyester resin-fiberglass cloth laminate over a styrofoam core.

Front half of the radome is patterned by a stainless steel, including a Neoprene compound, which is sprayed over the reinforced plastic film. The nose of both along the centerline is placed slowly against the dark area of the cockpit.

► **Back and Side**—Left portion of the plastic structure carries no protective coating, a light gray is used. A large rectangular access plate on the rather



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EQUIPMENT

Sabena Banks on Helicopter's Promise

- Fixed-wing operations benefit from copters as downtown-to-downtown service cuts travel time.

By George L. Christian

Brussels-Belgium's national airline is reinforcing its (downtown) network by the use of important studies facing it in the fields of equipment and development.

First Capital Service-Sabena (Société Anonyme Belge d'Exploitation de la Navigation Aérienne), has taken delivery of two Sikorski S-55 helicopters with which it has augmented the world's first international passenger helicopter service. Already conducting eight cities in four countries and flying about 1,400 miles a day, the service has proved so popular that the airline has had requests to bring its helicopters to the Belgians, East Dutch, West Germans and also new French lines. And after only two months of operation, the two S-55s have carried over 3,000 passengers. Two more S-55s are on order.

Sabena will not deny the possibility of placing orders for Sikorski's large passenger S-46 helicopter now nearing completion. The commercial version of the S-55 will have some 20 seats for 15 passengers and a crew of two under short-haul conditions, according to Grand-Accueil Corp. This will include allowance of 35 lb of baggage per passenger (Aviation Week, Nov. 30, p. 11).

DC-6 Services for north, ahead Douglas DC-6Bs have enabled the airline to offer both high-downtime (77 passengers) and the low "Royal Sabena" (26-passenger) service across the Atlantic.

Operationally, Sabena is the first trans-Atlantic carrier to inaugurate direct airship service from New York to Manchester via the English's highly modernized Midlands. The acquisition of the DC-6Bs allowed the airline's DC-6s to maintain service to Luxembourg, capital of Belgium's Grand Duchy.

On the Grand-Sabena's ground facilities at Brussels are growing under a vast expansion program. At Melsbroek National Airport, the built-upon airfield on overland and overwater facilities will be enlarged with the creation of additional shops and hangars.

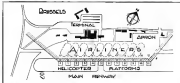
Concurrently, Sabena's superb, 55-mil-



S-55 ROTOCRAFT TEAM UP with fixed-wing aircraft in Sabena's operations.



FIRST international copter passenger service links Belgium-Holland-France-Germany



COPTER LANDING platform adjacent to where cars can wait at Melsbroek



BRUSSELS-MELSBRÖCK airport is Schenck's multi-track overhead center.



EXPANDED maintenance facilities include the 216,000 sq. ft. lounge at Melsbroek.



ENGINE (left) and prop assembly (right) are accomplished at these two shops.



low air facilities is moving completion. The modern, airy structure, which from Brussels' Central Airport Station, will feature direct, runway cut service to Melsbroek Airport. The 15 minute ride will operate every quarter of an hour. Furthermore, helicopter services Schenck had the building designed to provide canopy landing facilities for customers working up to 13 tons.

► The New-Way air marsh complaints on helicopters, especially by such a reliable small aircraft? A quick glance at a map of Western Europe explains the answer. In a circle centered on Brussels, a radius of roughly over 200 miles, live about half as many people as in

the entire U. S.—about 75 million. Yet, in that densely populated area there are only five major airports: London, Paris, Rome, Amsterdam and Frankfurt. Brussels is apparently at the geographical hub of these centers.

So the helicopter caters as sort of an agile ducking, nimbly and economical to operate at first, but promising a beautifully profitable future when burn and better machines become available. They will soon be available—more having flown or being well along in prototype construction today.

Schenck is already well along with the problem of coming out the more operational facilities which inevitably best

in current type of rates may bring at the outset. In the time the big machines become available, the center will have a substantial backlog of operational experience.

Assemble Versmolen, Schenck's vice president operations (and holder of the first helicopter license issued in a Belgium) says the advantage of a full copy's ability to save time in the thickly populated 400 mile circle are mounting. Benefits he finds in down time are none.

► **Slower but Faster-Schenck** officials have evolved a new dimension in saving flight time. When speaking of helicopters, they do not confine themselves to phrases such as "takeoff-to-touchdown" or "block-to-block." The new term "down-time to down-time" has emerged.

Here is how the 90-cph, \$ 55 stacks up against the 278-cph, Cessna 240, both of which Schenck operates on the 120 mile run from Brussels to Cologne, on a down-time to down-time basis.

- **Rotary-wing** machine time, including two intermediate stops: 1.40 hr.
- **Fixed-wing** machine, non-stop-Down-time Brussels to airport: 0.35 hr. Flight time (block-to-block) 1.08 hr. Airport to down-time Cologne: 0.45 hr. Total: 1.05 hr.

Total that for a 90-cph, 1.40 hr. So, in spite of being only certified as fast as the Cessna, the lumbering egg-beater shows almost a third of the total down-time to down-time time from the Cessna's schedule.

Fastest option has a \$30 cost advantage in apparently equal to first time from first.

- **Three jobs in Future-Versmolen** designs five, three tasks for the helicopter of the future flying in what he calls "the best part of the world for rotary-wing operations."
- **Link** cities which, to date, have had to rely on surface transportation.
- **Regular** funding aircraft on short, utility routes.
- **Find** passengers to fixed-wing aircraft at major airports. This funding can also be covered by having helicopter departures so that passengers arriving on fixed-wing aircraft may continue to destinations on the helicopters. That last feature is an important means of padding the high cost of helicopter operations, since it has already been demonstrated during Schenck's brief experience with the machines, that they do bring passengers to airports who otherwise would have traveled to the last resort.

► **New Link Money—J. Naess**, Versmolen's assistant, told Assemblée Waco this helicopter operation would really



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present state of the case which began as a heavy burden available

He asserted that Sabers was suffering a loss on its S-55 operation. He suggested that the financial loss being incurred today might well get outsize as the server is under and operational experienced period. Moreover, the cost of S-55 is not constant, as is the loss they are incurring beyond

► **What Subaru Wants**-Subaru spooks arm outlandish first needs for a profit able helicopter

*Twin engines with single-engine performance for safety. This will also permit night flying and instrument operations, neither of which are now permitted for passenger flying. All flights are restricted to daylight VFR operations. By making a biplane capable of operating at night and during bad weather, its usefulness will obviously be increased considerably. This, in turn, will contribute substantially to making the Bushmaster's operating cost

* Forty passenger capacity to provide sufficient seating for converted loads and crew transportation.

• **Free-stand:** entry and exit to permit speedy passenger loading and unloading. Such as airports, would permit passengers to disembark at one end of the machine while others board at the other. This simultaneous loading and unloading would be a big help in accomplishing a "fast" in helicopter operations—desirable in some cases.

Right now, Sobieski allows three minutes for its helicopter stops. A ride from downtown Brussels' airport at Alier Veste to Melsbroeck Airport proved the carrier sticks rigidly to schedule. And in this case, even in spite of heavy rain.

Solomon insists that future helicopters it buys be able to land in surface helipads, which measure about 300 ft. square. With such machines, capable of cruising at 125-150 mph, and operating from downwind locations, the navy's officials believe that the future of helicopters on these seas is almost limitless.

Caster Operations

Here is an outline of the helicopter service Sabena is currently operating with its S-55s between eight cities in Belgium, France, Holland and West Germany. Here also are some of the problems, some of their solutions and some of the findings of Sabena's year-long investigation.

• **Faces Mild to Frantic**—Sofone has been flying the road in Belgium with first two, then three Bell 47D1 helicopters for the last three years. So it was only natural to start the \$350 off as road currents shortly after their arrival.



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Reacts almost control opens or closes this new Part Start-Off Valve in one second. Actuated by pump pressure, it provides high flow rate with low pressure drop by use of a single poppet fastened to a flexible Teflon diaphragm. Specifically designed for turbine engine afterburner and rocket fuel feed systems, the valve is normally installed downstream from the pump. It has no close-fitting parts—handles unfettered fuel acceptable to the pump. Accidents in aircraft fuels do not affect the valve, and fuel control fuels do not corrode them.

In operation, fuel at pump pressure enters a chamber above the valve diaphragm through a filtered inlet bleed passage. Connecting the chamber to the downstream side of the diaphragm is an outlet bleed passage which stems when a solenoid is de-energized. Thus fuel pressure in the chamber holds the valve member in

closed position. Energizing the solenoid reverses the action — holds the valve open. DC power failure closes the valve — operation is fail-safe. If desired, an alternate configuration provides for opening the valve should power fail.

Integral legs permit mounting to the structure and allow adequate work area for attaching piping flanges.

SPECIFICATIONS Type 341 3/4" Red Steel 60" Valve
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OPERATING SPEED 1 second opening, 1 second closing; TIM
PERFORMANCE Meets 42-17 to plus 30-4 **POWER SUPPLY** 1750
 with 20, 1 square inch/min. **MATERIALS** Housing: Aluminum
 alloy Bearings and Seals: Teflon Valve: Monel and all other
 parts: Stainless steel **CONNECTIONS** ANSI 2500 150# **PIPE**
CONNECTIONS ANSI 1500 150# **Weight** 1000 lbs. **ORIGIN**
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1, growing in culture was initiated shortly thereafter, on Sept. 1.

In five months of operating the 830s, Sabena has been able to rack up three operational statistics with only two machines:

• **Utilization**—6–15 hr per day (fish cages are operated only during daylight hours—7 am to 7 pm, during the summer and 8 am to 4–10 pm during the winter, making this a relatively high demand).

• **Damage**—1,400 scheduled miles a day. In the three months of operation, the 8 1/2 ft made only one unscheduled landing when a suddenly low-lying reefing forced a swimmer to land in an open field. No damage resulted. (This period includes June, October.)

• **Load factor**—76.9% *Solomon* states this is a remarkably high considering the newness and inexperience of the women. The 76.9% figure is calculated on the basis of 100% load factor meaning every unit. Although the helicopters are equipped to carry eight, baggage usually precludes carrying a full passenger load.

• **Regularity—57.9%.** This figure is somewhat low because Solens currently has only two machines operating. If one has to go in for maintenance, certain scheduler would advise) inevitably have to be cancelled. And bad weather also plays an important part in keeping regularity down. When all four S-Vs are operating, Solens officials are confident that they will be able to improve considerably on the regularity figure.

★**Schiedam**—Three trips a day from Brussels to Antwerp and Rotterdam, two round trips, Brussels-Lille, one west-east, Brussels-Lège, Maastricht, Brussels—one trip, Brussels to Lège, Cologne, Bonn and return via Maastricht. All flights are flown daily except Sundays.

Schwen agrees citizenship rights within Germany, allowing the carrier to transport passengers between the German cities of Cologne and Bonn. It also has fifth freedom rights between Holland and Germany, meaning that it, a foreign company, may transport passengers between the German cities of Cologne and Bonn and the Dutch town of Maastricht.

► **How They Operate**—All S-55 operations is daylight VFR.

Wishybone knots are 300 ft and hold a male when flying over open country and 400 ft and hold a male when operating over built-up areas.

When flying into and out of cities, helicopters follow open areas so that pilot is always in a position to land his machine in a safe spot in case of trouble.

Through cooperation with the governments of the various countries being visited, Nelson was able to get out of

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6

AN IMPORTANT NEW GEOMETRY FOR



HEAT EXCHANGERS

As the performance rating of modern aircraft continues to rise, extremes of temperature and pressure of heat generating and its heat exchange equipment create new and demanding problems.

Today's emphasis on heat transfer systems gives particular significance to Janitrol's most recent advance in this field, a new type of "dimple plate" construction which improves efficiency, saves weight, increases strength, simplifies manufacturing, and opens a whole new geometry of design.

A standard heat exchanger can now, in effect, be fabricated from identical, paper-like stampings like that shown above. The sheets are welded in pairs, face to face, creating continuous passages for flow of air or liquid—each passage being at right angles to the next, and all passages manifolded in a single economical design. This construction increases rigidity of the assembly, facilitates distribution, and the plate also accelerates heat transfer by creating a desirable turbulence in the flow.



Observe that this new fabrication technique permits standard configurations previously without limit. Now, a high efficiency heat exchanger system can be spaced into spaces previously available, and duct or piping connections greatly simplified.

If your heat exchanger problems involve increasingly high temperatures, high pressures, or special space restrictions, you'll do well to investigate this new Janitrol development. In fact, whenever your aircraft combustion products, your Janitrol representative can place at your disposal Janitrol's thirty-seven years' experience in the manufacture of combustion equipment.

Janitrol

37 years' experience in combustion engineering

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GREER TOPICS Important News of Aviation & Industrial Test Equipment



This photo shows test machine and control panel for testing the J-47 jet engine. Greer engineer has an undisturbed view of engine under test through window at right.

Testing the J-47 Jet Engine with Greer Equipment



Another test unit for checking out one of Greer's highest test standards on among the nation's biggest. Greer helps maintain them.



Shown here is the control panel for another test stand. This, like other equipment shown, was built to exact collaboration with GE.

Greer test machines need to maintain high quality control at GE engine plant

Why does General Electric use Greer test machines in checking the J-47 engine? Is it Greer accuracy? Dependability? Experience? It's all of these, of course, and more. Greer points to an unequalled record for service to the industry, a reputation that guarantees complete satisfaction, a list of customers reading like a "Who's Who" of the aviation world.

Planted in test equipment, Greer has more recently moved industry-wide interest by furnishing the state-of-the-art test equipment. The Greer catalog (yours are requested) will present a representative selection of standard units for a great variety of testing jobs, and Greer's staff of engineers can help solve your problems.



Greer Hydraulics Inc., 454 Eighth Avenue, Brooklyn 15, New York
Plant Office: 2709 West Cermak Road, Chicago, Illinois • 23 Davis Main Street, Worcester, Mass. • 1000 West 10th Avenue, Denver, Colorado • and other representatives in all principal cities

single. Passengers please stand in a parallel with the helicopter's VHF receiver aerial as in the center with the pilot while he is talking to a passenger. He can hear the tones and cut the passenger off.

► **Mechanical Greer**—Adams and that he had had very little trouble with either the S-55 or S-55B.

Concerning the S-55B (the two machines had accumulated 550 and 300 hr respectively at the time of the writing), he said one of the new features of the machine was the automatic filter of most of the engine accessories such as injectors, carburetor and starter.

But the fuel pump is somewhat difficult to remove, so in the engine house Schuch is undertaking a modification to simplify replacement of the filter.

Schuch has installed all modifications requested by the U. S. Civil Aeronautics Administration. These include a three-way for detection system from non-electrical and heating engine case (no-chamber section), and engine case non-recovery section, and positive cabin door lock controlled from the cockpit, which prevents the door from being opened until pilot actuates a release.

A consideration on the S-55 is main engine clutch wear which requires clutch replacement every 200-250 hr. Clutch lining has tendency to wear rapidly, causing vibration. One remedy is to replace the component or replace it. A clutch change usually takes two hours elapsed time (light maintenance), he added.

The three Bellco also got very little trouble. Adams and The machines, which have accumulated 1,500, 2,100 and 500 hr, respectively, are used to do the small and for pilot training towards the S-55.

► **Bus Operation**—Schuch, the New York Airways, who operate passenger helicopter service with Bellco's S-55B between the three New York airports, is trying to simplify his helicopter service as much as possible and treat it much like a bus service.

As mechanical copies, paper work has been reduced to a minimum. All the pilot has to do is work with one, simple Loadsheet.

Passengers carry their own baggage on and off the helicopter. Baggage allowance is 10 lb (4.5 kg) per passenger except for those traveling to feed-out areas where their helicopter allowance is the same as that allowed on the regular. From Adams' perspective, the machine, he allowed the full 70-lb (31.8 kg).

One of the helicopter's right seats is almost always blocked to assure



Could It Fly Without Cherry Rivets? Certainly!

Without any doubt, the faster, more powerful jetliner—American Airlines' new DC-7 Tripping, could have been built (with some modification) without blind rivets. Existing at 365 miles per hour in the quiet cockpit of the fuselage section, you, as one of the 60 passengers on the aircraft's first morning transcontinental service, would never know the difference.

Yet, Douglas engineers will tell you that the thousands of Cherry Blot Rivets used in the DC-7 make it possible to accomplish fastenings which otherwise would be difficult or impossible. For example, the glass, steel,

dynamic design which resembles to the high speed of the DC-7 stems from the use of Cherry Blot Rivets in fastening components of several surfaces and other streamlined sections.

The complete air-craft units, the cabin interior, the upper air conditioning system are designed to eliminate bulk and excess weight. They involve many blind spots which are impossible for conventional riveting. Cherry Blot Rivets help make these adjustments quickly, securely—and costs are reduced.

Cherry Blot Rivets are installed by one man from one side of the work by a special gun which pulls the rivets into

the hollow shaft—springs the end on the blind side—finally clutches the rivet in place—fills the hole—all in a split second. Batching is eliminated.

Cherry Blot Rivets are in one group of the 10,000 types of fasteners and special cold-former parts produced by Townsend in its several plants. As "The Fastening Authority," Townsend will help you speed production—produce better products—and cut costs by applying its method of fastenings to your fasteners and small parts. Special hollow discharging Cherry Blot Rivets and other Townsend products and services are yours for the asking.



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This Lockhead special No. 725400 is a special high heat heat treated ball with P.S.I. of 800,000 to 200,000, with a diameter of 1 1/4" at the shoulder and 1 1/4" dia. at the threaded section. The head is 12 point. The rivet under the head and the threads are rolled after Heat Treat to control grain flow for strength. This rivet has a very high fatigue percentage. Ground before Final Treat because of no decarburization, thereby at increasing surface stress.

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actual size of AN 12251



mission located in the nose of the cabin. About the only way to quiet this mechanism is to add a lot of heavy sound-proofing, which is expensive.

In any event, none of the S-55's sales approach as leaders that receive fixed-wing sales since, in this respect.

Generally enough, although Sabena's cockpit agents into the hands of all but one of the sales it wants, the airline's officials say that "after over 5,000 landings and takeoffs, we have not received a single complaint about noise from the local residents."

■ **Free Helicopters**—Sabena officials speak in high praise of the "successful experiment" they have achieved from the transportation rate which their agents their helicopters.

Most towns gave the land for the helicopters and erected the small terminal buildings to Sabena's specifications at their own expense.

In Brussels, the heliport at Aéro-Vent is rented from a private organization. It is a two-story work from the North Station and the Place Royale around which are clustered some of the city's large hotels and principal shops.

At Milwaukee, 12,500 square heliport landing platforms have been an included subject to the land was plane landing area. So, when a helicopter comes in with passengers for a connecting flight, the tower operator may direct the machine to a landing spot close to the departing airplane. Platform #2 is reserved for the mail helicopter.

Almost everything is free. Sabena pays no rent, no landing fees and no fuel tax, at its destination heliports, according to its officials. Presumably the only expense of operating a heliport are payments for light, heat and the station manager's salary. Normally, he is the sole employee at the heliport, being traffic agent, ticket clerk, loading agent, dispatcher and station manager all wrapped up into one. The expensive way of operating heliports contributes naturally a larger indirect costs down to a minimum.

■ **At the two airports which Sabena serves**—Düsseldorf at Antwerp and Melsbroek at Brussels—there is a landing charge imposed because all airports are under the control of RVA.

■ **Copter Economics**—This is how the airline outlined Sabena's cost calculations.

Direct cost of operating the S-55's costs to 55 Belgian francs a kilometer, or about \$1 a mile. To direct cost is included fuel, oil, maintenance, spare parts, pilot's salary and amortization of the machine in five years with an annual value. A full load of seven passengers, charged 9 cents a mile, helps to 55 cents a mile for a loss of 37 cents a mile, with no indirect charges included.

Yet Sabena feels that the losses are

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HETHERINGTON Switches

not as severe as they appear on the surface because the copiers receive increased load-carrying traffic and the airline's operating people, maintenance gang and pilots are picking up available experience.

►Flying School-Solomon was nudged into setting up a flying school by lack of qualified pilots to handle its expanding fleet of fixed- and rotary-wing aircraft.

Candidates are usually engineers taken right out of school. After "side-ski" training, first on Tiger Moths and then on Souk-Solka, the 50-hp light decade business airplanes and helicopter. If the former, they go into DC-3s to complete, from which they will eventually jump positions as captains of DC-6s. In the latter, they get 500 hr. on the Bell before checking out as co-pilots on the S-55s.

Automation experience on helicopters is learned through the practice of having pilots make an automatic landing each time a coastline is flown back to the airport.

Sidelight on the Solon phase was obtained from Sweden with waterproofed equipment in various trials. However, when the ships were going to be used to train pilots to fly American aircraft, as thousands often had to be replaced with standard U.S. units or have the data rechecked to U.S. standards.

Solomon says it pays two-thirds of the school's cost, the government paying the remainder. The school has been in existence 14 years, has trained about 40 pilots and is in its fourth season.

►Congo Copiers—Solomon runs a half copier operation for the Belgian Congo Government. Three Western-built, government-owned, Sikorsky S-51 helicopters are used to spray insecticides and ridges with DDT in an anti-pest campaign. Recently have been highly successful in eradicating diseases spread by flies and mosquitoes, according to Solomon's subordinates.

Operation, which was started in 1951, is conducted on a contract basis. Solomon flies, maintains and overhauls the half copiers for the government. Four pilots are used for the three machines.

►Mail & Training—One Bell flies the mail in Belgium every day. Machine covers 455 km. (about 125 miles) around eleven cities within the country. Other men for the Bell are training and special flights.

Sidelight noted by a Solon spokesman: Although the full-bore coverings on the Bell add to the craft's weight and due to its low speed, the operation of the machine, Solon has found that they pay off in two ways. First, the sales offer an ideal spot to advertise the company and its power helicopter division. Secondly, the public finds that the tail boom looks much more substantial with the covering—the



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INTERNATIONAL BUSINESS MACHINES

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dent that there but will continue to be quite solidly met with U.S. defense manufacturers. They feature the possibility of additional orders for \$150 and \$250.

Why does Sabena lean to U.S. equipment?

Company executives answer: U.S. equipment has had a long excellent service and it built to last. Also, many components and accessories are interchangeable and common to all aircraft, greatly simplifying the problem of supply, not only at Brussels, but at more remote corners of the globe where the airline operates.

Available, nevertheless, Sabena's equipment is similar to that operated by other airlines flying through congested stations, permitting local head-on bus bargains which have helped cut one-thousand dollars away from home. Use of foreign equipment would greatly complicate their supply and logistics problems, Sabena officials say.

OFF THE LINE

Flight Refueling, Inc. has started preliminary work on the site of its new 71,000-sq. ft. plant at Fitchburg International Airport, Baltimore. Location will permit bringing aircraft directly to the plant for test and installation of the firm's probe-and-drip equipment. Plans are scheduled to be finished early next spring.

Texaco-Walsh Airlines has purchased 15 complete Afterschool aircraft maintenance systems for Lockheed Constellation planes that are being converted to cargo use. Equipment includes a compressor, oil-air separator, engine oil-changer, and altitude indicator, temperature regulator, heat exchanger, safety valve and pressure switch. TWA has now purchased 32 such complete pressurization systems since it began converting its 640 Constellation to high-density coach service.

Company planes can be operated for about the same cost as company automobiles, according to C. A. Brown, Jr., 79-year-old president of Pontiac Co., Brooklyne, N. Y. Brown figures it costs less \$15 an hour, or about half a mile to operate his 150-hp. Beechcraft Bonanza. Figure includes operating costs, depreciation and full insurance coverage for himself and three passengers. Plane is operated an average of 100 hrs. a year at about 75,000 miles. By contrast, recent American Automobile Assn. figures show that a car at the \$2,000 class, if driven 16,000 miles annually, costs about \$140 per mile, including depreciation and insurance, Brown points out.

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When the North American F-86 Sabre Jet swoops in for a landing, two steel fingers control the landing shock. Like fingers in a dike, the pins meter hydraulic fluid through a seal orifice to cushion the landing. Vested control of the pin service is very assistance developed.

These pins are Utica forgings, and point up an unusual development story. Under conventional forging methods, they would be expensive to produce because of extensive machining required. Forging is practical only because Utica has a "short-cut" production method for spacing for greater than the standard three diameters.

They start by spacing 18½ diameters

Each pin starts as a ¾" diameter, 21½" bar of SAE 4130. In one of Utica's electrical upsetting machines 11½" is driven—more than half the bar and, actually, 25½ diameters! The bulk of the rod is forged to rough shape, then machined to final dimensions. The Utica forged part replaced the original part which was welded and required extensive machining. The new half-forged part has greater

strength and requires much less machining. We are very proud the Cleveland Pneumatic Tool Co. picked Utica Drop Forge for this important defense job.

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Third Annual Fickens Conference

Hydraulic Group Tackles Problems

High-temperature fluids are still in development stage, meeting hours; trend to Teflon seals continues.

By Frank Shaw, Jr.

Detroit—Landing scheduled U.S. air force and several foreign jet services were represented here at the recent Transport Aircraft Hydraulic Conference, sponsored by Vickers, Inc. This was the final such conference in an annual series which began in 1951.

Nothing dramatic or radically new came to light at the tender session, but there was a lively exchange of views and information concerning the problems that wary hydraulic experts.

High-temperature fluids continue to be a high temperature and non-flammable hydraulic fluids.

Massachusetts General Co. reported no great change along these lines still in the development stage, a fluid, classified as a high-temperature type, is available in limited quantities. In addition to the jet, Massachusetts is developing a Skydrol 500 fluid. Whereas the former is a -60 fluid, the latter is a -45 fluid, according to MIL-STD-1710. Materials used.

Hollingshead Corp. also has a high-temperature fluid, as well as advanced version of H-1, under development but is not yet prepared to give out information or samples, the company reported.

Utica's Colwell announced that development work was "tentatively completed" on a new and improved water-based fluid for B-70's which Navy is in the process of evaluating in laboratory and bench-type tests. The fluid has not yet been flight-tested, but Navy should be doing something along these lines in the near future, Utica's Colwell said.

Non-flammable fluids—The air force is not in complete agreement on the subject of non-flammable hydraulic fluids. American Airlines and its subsidiaries that run flammable fluids as "a pretty expensive proposition maintenance-wise," are, however, more costly to handle, and "are not necessarily compatible with conventional aircraft materials." However, AA was its pen in this matter is not necessarily in its permanent, but still depends on further developments.

But American has found that Skydrol does a "pretty good job" as the super pump, and believes that the best place to use such non-flammable fluids is in the middle area, where the aircraft's main engine lines are located.

United Air Lines looks that the safety value of a non-flammable fluid is not worth the penalties involved in its use. Pen American and British Overseas Airways Corp. share this view.

Massachusetts claimed that the expense of its Skydrol fluid was apparent only. Although it costs about \$17.00 a gallon, it is good for at least 40,000 hours in the supercharger of the DC-6A, DC-6B or DC-7, for instance, when replaced it is used. Dorrless recommended it be changed every 250 hours. Massachusetts pointed out that pump replacement rate on units using Skydrol is far less than on those using mineral oil.

Effect on Seals—The problem of the effect of Skydrol on rubber seals is being overcome, Massachusetts said. The company has been working with various rubber manufacturers regarding hard rubber seals, and the Society of Auto-

mobile Engineers has set up a subcommittee to write a specification for hard seals. A progress report from the subcommittee is expected soon.

No action seems to be considering the use of Skydrol in Conquestair aircraft at present. However, Lockheed is evaluating the newer Skydrol 100 to determine its effects on the boost control valves, TWA said, and until the manufacturer issues a recommendation concerning its use the carrier will not consider it.

102. Experience—UAL described its experience with a DC-4 mockup equipped with Hollingshead H-2 fluid. Originally UAL had planned to equip its C-54 cargo planes with H-2, but ran into the problem of fluid quantity solutions. It was difficult to operate the fluid level in the sight glass in the cockpit with the quantity indicator in the cockpit.

Hollingshead said that it had recently found this trouble to be owing to the H-2, caused by the venting-type pressure-sensing system used in the plane. Reversing the venting eliminated the leakage and solved the problem, Hollingshead said.

There are at present no action steps with H-2, but the Civil Aeronautics Administration is operating three DC-12 with the fluid. Signal Oil Co. has rolled up about 600 lb with the fluid in a twelve-month period, and it is being used as a number of private aircraft. A sample aircraft takes of the Signal company's H-2 shows little change in characteristics, Hollingshead reported, and the new use of CAA's planes. There have been no incidents of corrosion or discoloration.

Teflon Seals—The continuing trend toward Teflon backup rings has lessened the problem of O-ring deterioration, according to Vickers. The new seals especially have in regard to Skydrol applications.

Chance Vought has been replacing all backup rings with Teflon for the last two years, and is quite satisfied with the results.

Pen American, United and American have set up policies of buying O-rings as individual, transparent, solid seals. These have been the experience of the seal, its use and cost data.

Trans World Airline has studied the possibility of packaging O-rings in less than 15 cents, but feels there is little to be gained from this procedure. Results depend on how the sealant handles the wet after it is removed from the package, TWA reported.

Food Displacement Pump—Dorcas has been working on a pump that can be topped on the water side of the bit installed to reduce oil and vibration (by damping out pulsations) on the Vickers FF7-901 pump.

Vickers and the new and improved

1929 In covered cockpit of his Curtiss model "NV-3," Jimmy Doolittle, using Sperry Gyro Director and Doolittle Gyro, takes off from Mather Field, San Jose 15 miles, and lands safely—accomplishing the first complete "blind" flight in history. Lieutenant Ben Kelsey acts as check pilot.



BLIND FLYING... another Sperry first... 1929



"Blind" flying has an interesting history. For years many people had flown "blind" on occasion through clouds. And in 1936, William C. Ocker proved man's physiological inability to fly "blind" without instruments. His experiments, based on the Sperry-developed Turn and Bank Indicator, helped pilots understand and use flight instruments.

The era of dependable all-weather flying did not begin, however, until Lieutenant "Jimmy" Doolittle made his historic "blind" flight in 1929. With the aid of two new Sperry instruments, he opened the door to dependable all-weather flying. From then on a pilot had no artificial barrier on his instrument panel—a barrier that couldn't be blotted out by fog or darkness. And a gyroscopic directional selector assured him of a precise course under all conditions, unaffected by magnetic disturbances.

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Twenty-four years have passed since the Doolittle flight. In those years Sperry has continued its development after development, utilizing electronics to make earlier instruments more precise, and to provide still greater mastery of the elements. With the Sperry Zero Reader® Flight Director, for example, military pilots now manually fly and navigate at supersonic speeds with accuracy and precision approaching that of automatic flight—and, with Sperry instrument, intercept and destroy enemy aircraft unseen by human eyes. The Flight Director is widely specified for precision planes and executive aircraft as well as for military use.

Photo by J. J. O'Connell



1932 Captain A. F. Hagenberger, Los Angeles BT-2A makes first solo "blind" flight and landing at Wright Field, Dayton, Ohio, using Sperry Gyro Director and Doolittle Gyro. This flight was significant in proving a system of "blind" flying and landing and resulted in Captain Hagenberger's winning the Collier Trophy.



1941-45

Sperry field instruments usable U. S. Navy and Marine forces to operate from deck of carrier, carry out missions and maneuvers in total darkness. Also, airborne radar helps pilots to seek out enemy aircraft and submarines.



1936 Air Corps Major Ben Kelsey, left, makes the first transcontinental "blind" flight—and alone—from New York to Los Angeles. This historic pursuit ship is equipped with Sperry Gyro Director and Doolittle Gyro. Major William E. Kasper pilots escort plane.



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the continuous bleed from low to high pressure is eliminated.

► **Pneumatic Valves**—Valleys stated that pneumatic valves in DC-6 Superjet replacement pump valves have been eliminated in all AA and AS-1500S pumps by use of Teflon packing in place of O rings. Douglas eagerly came up with the suggestion, and Valleys has published bulletin A43 to cover it.

American revealed that there were trouble on DC-6 superchargers has been difficult with the V.D. pump, particularly around the seal. "We've been quite a bit about the Teflon seal and its use in this location," said the American spokesman, "but recently we've heard a rumor that Douglas has seen or has coined on the Teflon seal." Douglas said this was merely a rumor with no basis.

► **Electric Auxiliary Pumps**—The current demanded pressure settings for the Converter 348 emergency pump circuit. The American stated that when the relief valve in the 348 system is set at a test bench for about 1,500 psi, the aircraft under flow condition is gone as high as 1,160 psi. Valve reads again in the night pressure on the bench, 7AA confirmed, stating that they have now started to flow-check relief valves on the bench rather than set just the cracking pressure. Then flow it at about 1.5 gpm.

Northeast and Delta stated that they have been using the recommended Converter settings and have had no such trouble on the 148. American revealed that currently their emergency pump goes through the system relief valve, adding that they are now putting in a separate valve in a second system where valve will be set at 1,500 psi. ► **Fluid Equipment**—McDonnell's second Valleys motor failure (overhaul cooling fan) has been replaced. Four cap screws which secure the bearing retainer to the housing failed and allowed the rotating group to come out of position.

Valleys said that they had metal logistically examined the screws in question and that it was their opinion that they had been improperly heat-treated. Valleys is in the process of examining all screws of that type in stock to eliminate the bad ones.

► **Valves**—For American's Pacific Division has experienced difficulty in establishing the maximum carbon, cut-out differential in the AA-M5D bleed-off valve.

The carrier's Latin American division noted that they were having the same trouble in Mexico. It was felt the trouble has probably been due to new gear hydraulic units which they had used to put in Toluca was not used, and rejected ones have been sent back to the Valleys.

Valleys stated that although they

had not as yet received the parts at the time they are returned they will be checked as a valve to see if it is a matter of tolerance and design.

The American's Pacific Division then added that after working with the problem for about six months they finally found it was a question of tolerances, and by having the hydraulic unit and pump merely very slight to increase internal leakage the problem was corrected.

► **Accumulators**—The meeting heard many complaints about the increased rate of failure of Rhodes Bladders and Valleys diaphragms in accumulators.

Valleys explained that it was probably a matter of quality control. "Visual, as even chemical inspection, has not proved to be the answer, and now Valleys is actually accelerating the phasing from each batch to get consistent quality."

The consistency angle was stressed by Packard. "We didn't use to much how long the bladder has lasted so we got a bladder that will last a specific time and eliminate pressure failures," Packard's representative said.

Valleys felt that if properly stored, the shelf life of an accumulator should be five years. Valleys desires diaphragms that have been in stock over two years to insure that customers will get maximum storage life from the tests.

However, diaphragms that have been returned by Navy for over-ages—four years to 10 years—have proved good as new in re-testing, the company and Navy diaphragm inspection is certain that one they intended to fail.

AN's representative suggested a meeting with rubber manufacturers in addition to accumulator diaphragm, similar to one set up last year to deal with O-ring problems.

Douglas said it is now recommending that the dual accumulator installation on its DC-600 planes be considered optional. American, having its location on its experience with the Converter, which has only one accumulator, is ordering the DC-7 with a single unit.

► **Tube Fittings**—Weatherhead's Enroflex tube fittings got a number of hits at the conference, although criticisms were expressed in this way:

Charles Vaughn is using the Enroflex on the 1,000 psi system of a work tray airplane, on both aluminum and steel steel. Up to now, CV has made 100,000 assemblies (100,000 fittings) with a rejection rate of 10%. He said that first experienced with standard AN fittings. The complete airplane is accumulated to 4,500 psi four hours after completion. There have never been any blowouts of such that they have passed the series of regular tests, CV says.

Orsted, which was the Enroflex



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Control & Release Valve System			X
AL-10 Motor	X	X	X
Red Valve Converter	X	X	X
Aluminum Hydraulic System	X	X	X
Control & Release Valve System	X	X	X
Pressure Control System	X	X	

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fitting on the 5,000-gal. Shidek system in the Coors, found that it calls for an industrial process with the maximum amount of turning on a wrench with all their might to clear into a hole, the mechanics have to be turned to work back off the fitting and adjust it. They must also be educated in positioning the fittings.

Tom Wold, Arkansas, says the fit, with AC and AN fittings, but prefer the former.

►Turning—Operations was divided on the question of welded vs. seamless tubing. Boeing and Superior Tube Co. pointed out that internal scoring may cause early fatigue failures.

Superior told the meeting that it turns tubing in welded and down to as available in a variety of sizes. Some seamless titanium tubing is also available.

There is still a good deal of work to be done, but Superior expects that seamless titanium tubing will be available in unlimited quantities in the next six months or so.

Boeing reported that it has started development work on titanium tubing and fittings for the Navy. Some fitting testing has already been done.

Designs announced completion of a contract study under USAF contract on the fatigue characteristics of stainless and titanium hydraulic tubing and the effect of tubing quality and detection methods variables on fatigue life. The report, DHEV-82, is available to qualified companies on request to Douglas Aircraft Co., Santa Monica, Calif.



Toothpick Trick

Their mechanic at Kelly AFB, Texas is using USAF 16,171 to remedy. The 16,171 is a small toothpick method of hand-curved wooden sticks into the 542 holes in a helicopter's main rotor. Made with nails attaching fabric and obvious strips to the stick's leading edge have been removed. Toothpick fits, plug to hold new rods.

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A new film lubricant, Dylube, is said to act like a barrier to some of the most common corrosion and oxidation problems of aircraft, gasket leakage and metal abrasion.

Dylube is a dry, flexible, solid-surface lubricant bonded to its applied surface. It is applicable to steel, aluminum alloy, brass, titanium and its alloys, as well as rubber, some plastics and adhesives.

Dylube coating processes are designed for use on parts where bearing surfaces or temperatures are beyond the capacity of conventional lubricants, and where the danger of scoring, galling or seizing exists, in aircraft engine parts.

Its special characteristics include high film strength, low coefficient of friction, corrosion resistance, chemical stability and the ability to withstand extremes in temperature ranging from 1000 to -150 and intermittent exposure to 2000°.

Steel and aluminum surfaces are cleaned thoroughly and a phosphate corrosion resistant coating is applied in preparation for the Dylube process. Stainless steel and brass are treated by use of a dephosphorizing process.

The coating is then applied under regulated humidity and temperature conditions. Each coated part is cured by baking at temperatures which do not affect any previous heat treatment.

Among stress for which Dylube is designed are machine gun and cannon heat loads, servo seals, expansion joints, fuel cell water manifolds and valves, engine oil and rocket chamber components, and auxiliary powerplant components.

Dylube Co., 733 West Broadway, Glendale 4, Calif.

Aircraft Circuit Breakers Are Small but Rugged

New Klaxon circuit breakers, in ratings of 1, 1 and 1 amp, are being offered by Spencer-Tennant Div. of Metals and Controls Corp.

Designated DC6755-1 and DC6756-1, the breakers are completely sealed for protection of power supply in aircraft instrument circuits. DC6755-1 is the manual reset, non-indicating type, while the DC6756-1 is the automatic reset version.

Units are exceptionally small. Two DC6755-1 will fit in the same mounting space used by one AN type push-pull circuit breaker, says manufacturer.

A snap-action breaker disk is the resetting element. Breakers are said to withstand shock of over 25G and a vi-



bration frequency of 10 to 55 cps with total endurance of 9000 in.

Spencer-Tennant Div. of Metals and Controls Corp., Arlington, Mass.

Low Hysteresis in New Measuring Instruments

A new line of scientific instruments for ground and flight measurements is being introduced by General Scientific Corp.

Included in the group are linear and angular accelerometers, displacement, pressure and differential pressure transducers, strain gages and vibration study sets.

Units come in two types: An inductive type for use in aircraft, and a "locking" strain type for use on other aircraft or in ground measurements. Manufacture is currently producing self-contained and externally power-supplied models.

The instruments have a number of air features. Suspension systems is said to reduce hysteresis considerably. Inter-unit coupling has been eliminated and electric debarkation has been added.

Manufacture states that instruments have an accuracy 1% of full scale or better throughout a temperature range from minus 55° to 200° and a resolution rate of .55% of full scale at 100 cps.

Standard ratings are from .0005 to 5,000G for linear accelerometers; 0.1 and .001 in./sec. for angular accelerometers and 0.05 in./in. for strain gages.

General Scientific Corp., 603 North La Brea Ave., Los Angeles 36, Calif.

Selenium Unit Provides D. C. Anodizing Power

Completely self-contained, ultra-compact anodizing module is known as the power for electroplating and anodizing in frame and engine parts are being marketed by Regal Electric Co.

In these units the three individual

phase controls have been replaced by single knob controls, eliminating the possibility of single-phasing when operated by unskilled workers.

Use of single knob controls is said to permit voltage and current changes in low amperages with an output from 0 to 12 v.

Units are available in models ranging from 5 to 5,000 amperes and 1 to 60 v. output.

Regal Electric Co., 2321 Middlebrook Rd., New York 61, N. Y.

ALSO ON THE MARKET

Surface plate made of black granite is being offered in small size for bench use. Known as "benchtop flat," unit measures 36 1/2 in. x 15 in. and is finished to an accuracy of 0.0002 in. inch. Price \$17.95. Collins-Macmillan Co., 2325 E. 8th St., Los Angeles 21.

Magnetized denture plates, known as No. 10, feature self-cleaning action that cleans, polishes and detaches all types of metal and plastic in one operation. Flooded together with special resin, plates eliminate need for hand scrubbing with a brush, soap, water and toothbrush. Available in grade range from 1 (small) to 5 (full).—Atlantic Abrasive Corp., South River 35, N. J.

Speed clamp, designed primarily to secure hoses to engine fluids, also can be used to attach flexible connections to smooth control systems. Black-on-steel, fully sealed and easily connected. Unit can be applied to three different hose diameters, ranging from 1 to 1 1/2 in. can be locked from an angle with use of pliers.—Tennant Products, Inc., Cleveland.

Push-button switches with weather-proof and non-spark contact features are said to be used for use in machine guns and from light controls, and compass, bomb and autopilot release mechanisms. Units may be ordered with variety of adaptors to meet almost all mounting requirements. Types include SP-51, 3-terminal or SP-51A metal arrangements. Current ratings are 10 amp resistive, 5 amp inductive, and 3 amp lamp.—Heflinger Corp., Sharon 10, Pa.

Thermocouple probe senses exhaust gas temperature of turbojet engine rapid rise of dynamic engine speed or in test chamber level, manufacturer claims. Unit gives linear response, is effective in minimizing errors of indication due to recovery, induction and conduction. Aero Research Instrument Co., 180 N. Harbinger Ave., Chicago 22, Ill.

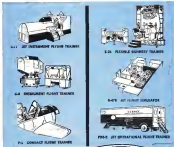
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AIR TRANSPORT

ATA Issues Long-Range Forecast

Copter Outlook: Third of Air Traffic by '70

- Intercity airline travel is expected to double.
- Association cites growth in battle for airport aid.

By Lee Moore

Air travel among U. S. cities will more than double by 1970, Air Transport Association forecasts, and helicopters will fly a third of the intercity passengers by then.

ATA's predictions are submitted in exhibit form to the aviation industry's Airport Advisory Panel, which this month will make recommendations to Commerce Department concerning the recently suspended federal aid airport program of subsidies for municipal field construction.

Here are highlights of the ATA forecasts of 1975-70 increases in numbers of intercity passengers and tons of air cargo.

- Scheduled domestic fixed-wing transport passengers from the U. S. airports will increase 55% by 1970.

This low figure is explained by a prediction that scheduled airlines will use helicopters to take over most short-haul, intercity business, such as New York-Philadelphia.

- Intercity helicopter passengers will reach 6 million a year by 1970 and nearly quadruple that by 1975.

- Scheduled international fixed-wing passenger traffic of U. S. carriers will double.

- Total U. S. scheduled passenger tons of the intercity cargoes, will average from 12.5 million this year to 72.7 million in 1970, or about 125%.

- Nonscheduled cargo will increase their number of intercity passengers by about 115%.

This is based on an assumption that worldwide will continue to hold their relative share of total business.

- Foreign flag airlines will increase their passenger traffic to and from U. S. by about 195%.

- Domestic cargo tons flown by U. S. carriers will grow more than threefold.

- International cargo tons enplaned by U. S. carriers will almost triple.

- Twenty-four million cities will produce two-thirds of the passengers, just as they do now.

- Fixed-wing aircraft departures from

Airline Traffic Growth Forecast

	1955-1970	1975	1980	1970
	1955	(in millions)		
Fixed wing passengers				
Domestic	29	55	98	46
International	3	1	4	5
Total U. S. scheduled	32	56	102	51
Foreign flag	2.3	0.4	0.5	0.7
Intercity	6.7	0.8	1	1.5
All passenger carriers	53	58	102	75
Helicopter passengers*			6	12
Cargo (tons enplaned)		(in thousands)		
Domestic	320	370	512	1,180
International	71	85	108	238
Mail (tons enplaned)		(in thousands)		
Domestic letter mail	21	26	54**	108
Domestic parcel post	26	42	79	224

*Excludes all helicopter traffic except non-commercial and direct intercity passenger carriers to multi-engine destinations.

**Passenger transportation in 1960 of all carriers for all years not meeting these data will be reduced by 10% to 15% and is anticipated that the average carrier will be reduced by 10% to 15% in 1970 and 1975.

Source: Air Transport Assn.

Intercity Helicopter Passengers Through Fixed-Wing Airports*

1960	1970	1960	1970	
(in thousands)	(in thousands)	(in thousands)	(in thousands)	
Miami	12	127	32	81
New York	174	460	90	129
Seattle	24	90	21	78
San Jose	40	141	26	95
Los Angeles	75	276	32	129
Chicago	7	15	17	64
Memphis	20	71	28	87
New Orleans	20	71	28	87
Boston	31	119	17	64
Atlanta	40	141	26	95
Houston	21	78	15	56
Dallas	40	141	26	95
Washington	79	281	32	129

*Forecast is that this will increase only 50% of total intercity carrier passengers.

Source: Air Transport Assn.

the 25 ranking cities will increase from the present 1,141,000 a year to nearly a total of 2,037,000 within the next 17 years.

That is a smaller percentage increase than there will be in number of passengers enplaned and debarking at

these airports, because each transport will be bigger, handle more passengers per flight.

■ Big City Badlands—ATA selected 35 leading air traffic cities in the U. S. on the basis of number of passengers handled and volume enplaned per air-

BY THE MCGRAW-HILL DEPARTMENT OF ECONOMICS

The Outlook for Business Air Travel

THE BUSINESSMAN of the 1960s is going to be more of a traveler. He'll have to be. Business is getting more and more national and international in its scope. And the technology is to cover the nation, and the globe, with branch plants and branch sales offices, rather than trying to make and sell everything from one coastal location.

Of course, the executive doesn't always have to travel as person to see what's going on. There are other methods of communication that will be improved to give him reports on branch operations. Telephone, teletype, TV and microwave will all be used to give him remote control. But there still will be an increasing number of situations where the man from the home office has to be on the spot, or where people from branches have to go to the central office themselves.

Here are some of the developments that are likely to make most trips and longer trips, be more numerous.

DECENTRALIZATION of manufacturing plants. The trend is to have several plants, each with its own market area. For example, all Ford cars were once made near Detroit for sale all over America. But today, Ford has new assembly plants in California, New Jersey, Georgia, and Kansas City, plus 16 regional parts depots.

The same sort of decentralization is taking place in the steel industry, with plants now spread along the East and West Coasts, and in the Gulf South. More widespread use of the electric furnace in steel-making is expected to lead to still more, smaller units serving additional areas, even from the main steel centers. For a host of other products, from auto components to industrial instruments, assembly plants are spreading out.

INTEGRATION of small companies into national corporations. That is a trend in fields where there are many small units spread around the country, such as in food processing, or pharmaceuticals. And mergers of two or more large chain operations are becoming more and more frequent. The central problem, and so the need for travel, grows when diverse plants acquire a central headquarters, just as it does when a parent company builds branch plants. In fact, integrating independent units in fields that up to now have been "small business"—persons away of a problem then spending not a single firm.

COMPLEXITY of industrial operations. Today's plants use raw materials shipped from many points. Today's owner's plants will buy from more and more widely scattered. More and more materials will come from abroad. Similarly, as machinery gets more complicated, more parts must be purchased (or manufactured) at more

locations. The automobile industry, for example, now has as many as the manufacturing of special steel, electrical systems and new plastics—all made away from Detroit. Thus, the purchasing agent's job is likely to become more and more varied.

Also, engineers and designers will travel more to get information about the increasingly complex fields they compare and estimate. They'll have to visit other plants and take university training courses. For example, the advanced management courses now given at Harvard Business School and MIT might double in size enrollment in the next 10 years. And those like them will be set up elsewhere.

CONVENIENCE—always a big factor in business travel—will be an increasing advantage for the salesman. As schedules are speeded up by the use of jets, the possibility of traveling to branch offices for conferences will be increased. Perhaps more important than speed will be the elimination of fatigue caused by long and uncomfortable journeys. As air travel becomes quicker, and fatigue is eliminated, it's going to get a more frequent share on the executive schedule. This applies particularly to older executives. Many of them can't stand the gall of frequent trips today.

BUSINESS ABROAD will represent a gradually increasing share of U. S. business and will require an increase in travel. The American business offices today are scattered somewhere between New York and Chicago, with a radius extending to Canada and New England; to the Southwest, Gulf South and Far West. By the 1960s, this same area will be more closely knit together by highway transportation. And the radius of business travel will stretch into Northern Canada, South America, West Africa and Western Europe—not just occasionally, but frequently.

BUSINESS IN WASHINGTON will continue to be a growth industry. The businessmen never has to visit Washington as much as military firms as in national corporations. The Korean boom, for example, is over. But the long-term trend is for more national entities to require Washington consultations. Businessmen are going to be working far, or advising, the government more and more as time goes by. Government will keep extending the sphere of business in which the public has an interest. And if the system is to keep working fairly for private enterprise, businessmen will have to get to Washington to explain, advise and administer—as well as to get the information and rulings affecting their particular companies.

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LETTERS

Helio 'Bootstrap'

The article in the Nov. 24 issue [p. 17] on the twin-engine Helio drops tonnes in one move. This casual attitude and condescension to be long in your attention is a disgrace even as your reporting. Although Paul Kappan was regularly credited with parts on Helio designs, he did not design the two-engine airplane you have reported on. In the model designation H-6, I believe Paul Kappan is too honest a man to be seriously credited for the work of others and, likewise, this article must have been written without his own knowledge. I am sure Paul Kappan will realize what I have said.

As for the H-6, which originally was developed H-6 was designed by a group of aircraft engineers and test pilots of the Division of Medicine in a battle against total schedule of work and overhead work. The group, of which I was present engineer, was engaged by Helio to design two airplanes, the H-6 (two-engine design) which we nicknamed "Bootstrap" and one other we called "Redneck". Although we had access to a limited number of Paul Kappan's notes on the original two plane Helio plane and I personally had several visits with Paul Kappan, prior to the date of H-6 was to design his own on Helio-type airplane. His actual writing of the specific data and the design of the H-6 were only possible at his residence. In fact the first of the model that Paul Kappan was the first step of the preliminary design report, which was submitted for Wright Field consideration.

For the record, these were some of the designers of the Helio H-6: Richard M. Brown, Harold Allen, Robert Collins, Paul Lerner, Joseph Harris. Also contributors were: Stanley Boock, David Wason, William Neuber, John Green, Helen Clark. Since the work of the Helio H-6 was successfully completed to Otto Korman, it would appreciate your checking the identity of this letter with him and then printing its contents.

WALLACE J. WILSON
Research Engineer
Engineering Research Institute
University of Michigan
7605 Plymouth Rd.
Ann Arbor, Mich.

... And Teamwork

In accord with Mr. Wallace Wilson's letter of Nov. 23 to me, Paul Kappan and I should like to affirm that he and the way this rule have succeeded only by his direction at the University of Michigan could never fall right for the specific Helio two-engine design study described in your Nov. 24 issue.

Paul Kappan's contribution to that design study was minimal to his personal development of the basic concepts which he had by then reduced to practice on a small single-engine experimental airplane. In fact, he had only been observed to be present in the Pennell Airplane Corp. that this design

feature was an endorsement, and from applicable in larger aircraft. This could be confusing them could rate a better agreement with Helio Aircraft Corp. based primarily on a weekly Helio engine studies, which powered with Lycoming 350-hp engines. However, a Puchold modeler group built a short time thereafter only based the concept and the project, along with others attributable to the engine manufacturer was solved.

Regarding Mr. Wilson's question, and perhaps a solution to him of the fact that a South Carolina modeler receiving the short of engine and with the same size 13-hp engine had this been submitted to Paul Kappan in 1940. Interestingly, Kappan's two-month performance representation for this distance made at that time were within 7% of the model calculations later worked out by Wilson's group (the evaluation by the USAF Aircraft Laboratory at Wright Field).

Wilson and his group were known to be in contact with Kappan without any relation upon Kappan's credit representation to the modeler's team. Then very close the difficult assignment of weight, the combination of passenger and driver that Kappan had evolved on the Helio engine and model would not apply to this in larger design involving 200 hp engine. The same after that had permanent exhibition were set to hold them as the Kappan's earlier design work.

Full credit for the general H-6 Helio-type design study and for its detailed performance calculations should go to Wilson and his University of Michigan group. Credit for demonstrating the way and for solving the fundamental control and stability problems that have been solved under such close to H-6 airplanes respectively for several years go to Paul Kappan of MIT.

As a result of this, the total course of development in the result of teamwork to which many contributed.

LENN L. BULLOCK
Chairman, Helio Aircraft Corp.
Norwood, Mass.

Super-92

Your Oct. 5 article "Four-Engine Super-92" states that Paul & Wilson estimate that "thrust down" on the Super 92.

CIA approves the Super 92 executive Super 92 DC-3 plans and systems with a set program appears the Super 92, and a scheduled earlier in response to change to Super 92. It has thousands of hours of extensive DC-1 operations with no failure of any kind, including an overhaul, and ground intervals and costs have been similar to or better than the 92. The Super 92 has been shown in no other engine on the Super 92 engine a normal statement that a competitor has been shown down to it.

P-W magazine had us part in the development of the Super 92 engine a complete knowledge of its design or con-

ponents. The of better engines is only one of the improvements made over the original 92.

P-W will surely cannot be expected to look favorably on engines which give DC-3 over 300 mph for \$11,500 at low, complete and only to go show that our engine produces 12,000 after only 110, 170 and the 130, 350 per engine, plus most needed features for different purposes, of course, engine modifications, modifications, etc. They also select their own 17.5 on DC-1, but there have been no complaints from executive opinion, and they are still standing in demand. We are actually getting a lot of engineering as well as operational observations to make available in American West, operation West & Wilson, as we also intend to provide and will send a copy to Mr. Chairman for his signature.

G. S. WILSON
Research Engineer
Lynchburg Field
St. Louis Mo.

Leeward's DC-3s

We wish to call your attention to an article in the Oct. 5 issue [p. 52] regarding the Pioneer Air Lines H-6 stability.

In the article you state: "Pioneer two-passenger charter plane of the DC-3 from Pioneer Air Lines." Just for the record, this is not correct. All the aircraft were built from Leeward Aircraft Service and the aircraft brand was formerly owned by Pioneer Air Lines. For the record, the Leeward is a wholly owned corporation of National Aircraft Service.

A. J. LERANDE, General Manager
Leeward Aircraft Service
Post Office, Ind.

Ercos Simulator

Having read "RAF Gets Anomaly Line P-54D 'Tumbler'" in the January edition of AVIATION WEEK, Oct. 15, 1955, I would like to qualify our earlier statement.

The Engineering and Research Corp., in addition to being another supplier of aircraft designed, developed, and for over two years has steadily has produced the various P-54D "Flightmaster" simulator. KENNETH C. FRYMAN, Engineer
Engineering and Research Corp.
Waltham, Mass.

Canberra's Altitude

The Aug. 21 Aviation Week has just been done in an attention in view of the latest Canberra comments appearing in page 17 and column two, page 18. I do not think I need belabor the point with you that it is the Overpowered Canberra which holds the record, which is the world, and that this was most certainly achieved on a true Altitude Flight.

C. B. ELLIOTT-WATSON
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Page 10, 1955



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